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Article I.—A REVIEW OF THE LAND MOLLUSKS OF THE BELGIAN CONGO CHIEFLY BASED ON THE COLLECTIONS OF THE AMERICAN MUSEUM CONGO EXPEDITION, 1909-1915[1]

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ECOLOGICAL NOTES BY THE COLLECTORS, HERBERT LANG AND J. BEQUAERT

PLATES I TO XXIII, 3 MAPS, AND 163 TEXT FIGURES

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[1] Scientific Results of The American Museum of Natural History Congo Expedition. General Invertebrate Zoology, No. 2. Bull. Amer. Mus. Nat. Hist., XXXVII, Art. 36, is No. 1 of this series, not No. 2 as there stated.

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INTRODUCTION

The collections of the American Museum Congo Expedition were made chiefly in two districts: the Lower Congo, from Leopoldville and Thysville to Banana at the river mouth, and in the Aruwimi-Ituri Valley; smaller lots being taken at Stanleyville and northeast beyond the limit of the forest at Faradje. Other localities are represented in the collections of aquatic mollusks, which will be considered in a paper to follow.

A large and important series of mollusks taken by Dr. J. Bequaert from many places, on the Semliki River, on Mt. Ruwenzori, southward in the region about Rutshuru, and also on the Lower Congo, has been placed in my hands for report in connection with the collections of Messrs. Herbert Lang and James P. Chapin.

Over 6000 specimens of Congo land mollusks have been examined in preparing this paper; of these about 4200 were collected by the Museum's Expedition. The collection contains representatives of 214 species and subspecies, which brings the total of terrestrial snails and slugs known thus far from the Belgian Congo to about 400 forms.

ACKNOWLEDGMENTS

The writer desires to acknowledge here his indebtness to Professor H. F. Osborn, President of The American Museum, Dr. F. A. Lucas, Director, and Dr. H. E. Crampton, Curator of Invertebrate Zoology, for the opportunity of studying this important collection.

Mr. Herbert Lang, leader of the Congo Expedition, has furthered the work in many ways. His kindness has been unfailing. The field notes contributed by him form an interesting and important part of the paper.

Dr. J. Bequaert not only contributed his large collections, but also undertook to compile all Congo records of mollusks, submitting the result of this very considerable labor for inclusion in this report.[1] He also prepared maps showing the collecting stations and other localities mentioned and others representing graphically the distribution of several genera, with notes thereon. The author feels under serious obligations for this generosity, as well as for various suggestions during the time Dr.

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[1] These records, in each genus, follow the account of the species collected.

Bequaert spent in this laboratory. By his large local knowledge of the Congo, many errors in previous work have been corrected and the geographic allusions systematized throughout.

M. Philippe Dautzenberg, of Paris, has kindly compared certain Achatinæ with type material, giving the author the benefit of his advice.

Finally, the author would acknowledge the reliable work of Miss Helen Winchester upon the drawings and photographs of shells.[1]

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[1] The illustrations of soft anatomy were drawn by the author.

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The following new names are proposed in this paper:

Homorus robinkempi Pilsbry, p. 122, footnote; for *Homorus foveolatus* Preston, 1912; not *Homorus foveolatus* Preston, 1909.

Ptychotrema katangense Pilsbry and Bequaert, p. 214; for *Ennea joubini* Dautzenberg and Germain, 1914; not *Ennea joubini* Germain, 1912.

All the type specimens of the new forms, including those collected by Dr. Bequaert, are deposited in The American Museum of Natural History. Paratypes and duplicate specimens of most of the species are in the collection of The Academy of Natural Sciences of Philadelphia.

APPROXIMATE LOCATION OF PLACES MENTIONED IN THIS PAPER

Modern studies on variation and distribution make an ever increasing demand for accuracy in geographical data relative to biological material. I wish to emphasize the importance of correctly labeling collections in the field and of carefully preserving such locality records until the material can be studied. In mountainous regions specimens from different slopes, valleys, and altitudes should be kept separate and distinctively labeled. It is recommended that, whenever possible, collectors give preference to locality names found on commonly used maps, or at least connect the native names with such better known localities. In working on the bibliography of African mollusks, great difficulty has been experienced in locating on existing maps the geographical data mentioned by authors. For this reason an attempt has been made here to list all places in the Belgian Congo whence snails and slugs have been reported, with their approximate location, and also other geographical names mentioned in the paper. The altitude of important landmarks is given in meters. This directory, together with three maps, was prepared under the direction of Dr. Bequaert.[1]

A source of much inconvenience is the African custom of changing the name of a locality every few years, or of having at one time several names for a place. The confusion produced by this method is well instanced by v. Martens' work on the East African mollusk fauna, which contains many locality records of the northeastern Belgian Congo; disregarding misspellings, this book from page to page gives different names for the same locality, river, lake, etc. All these are Stuhlmann's, and he had the unfortunate practice of recording as many different names as possible for the same geographical item. In order to solve the riddle of these names, one must carefully study Stuhlmann's report on his journey with Emin Pasha.[1]

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[1] Localities marked with an asterisk in this list have not been found on any map.

Aba (R.).—3° 50′ N., 30° 10′ E.
Aberdare (Mts.).—0° 30′ S., 36° 30′ E.
Abidjean.—5° 15′ N., 6° 20′ W.
Abumbi (R.).—1° 50′ N., 30° E.
Akok.—8° N., 5° 30′ E.
Albert (L.).—1° to 2° N., 30° to 31° E.; 618 m.
Albert Eduard (L.), see Albert Edward (L.).
Albert Edward (L.).—0° to 0° 30′ S., 29° 30′ E.; 914 m.
Albert Nyanza, see Albert (L.).
Alima (R.).—1° S., 16° E.
Amani.—5° S., 38° 45′ E.
Ambaca.—9° 20′ S., 15° 5′ E.
Ambriz.—7° 45′ S., 13° 5′ E.
Ambrizette.—7° 25′ S., 13° E.
Andetei.—0° 40′ N., 29° 35′ E.
Angi.—1° 15′ S., 29° 20′ E.
Ankoro.—6° 50′ S., 26° 50′ E.
Aruwimi (R.).—1° 20′ N., 27° 40′ E.
Avakubi.—1° 20′ N., 27° 40′ E.

Baginse (Mt.), see Baginze (Mt.).
Baginze (Mt.).—5° N., 29° E.
Bahr el Ghazal (R.).—9° N., 30° to 32° E.
Baker (Mt.).—0° 20′ N., 29° 55′ E.; 4873 m.
Bamou (I.), see Bamu (I.).
Bamu (I.).—4° 25′ S., 15° 30′ E.
Banana.—6° S., 12° 20′ E.
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Banco dos Pescadores, see Banana.
Banza Manteka.—5° 30′ S., 13° 50′ E.
Baringo (L.).—0° 40′ N., 36° 10′ E.
Basoko.—1° 20′ N., 23° 35′ E.
Bena Bendi.—4° 15′ S., 20° 20′ E.
Beni.—0° 30′ N., 29° 30′ E.
Benue (R.).—8° N., 7° to 10° E.
Beso.—5° 5′ N., 19° 25′ E.
Bihunga.—0° 20′ N., 30° 5′ E.
Bikoro.—0° 40′ S., 18° 25′ E.
Boa (R.).—2° N., 30° 5′ E.
Boga.—1° N., 30° E.
Bogoro.—1° 30′ N., 30° 20′ E.
Bolengi.—0° 5′ S., 18° 10′ E.
Bolero (L.).—1° 25′ S., 29° 40′ E.
Boma.—5° 50′ S., 13° 10′ E.
Bomili.—1° 30′ N., 27° 20′ E.
Boswenda.—1° 20′ S., 29° 20′ E.
Brazzaville.—4° 25′ S., 15° 20′ E.
Buddu.—1° S., 32° E.
Buea.—4° 10′ N., 9° 15′ E.
Buessa.—1° 20′ N., 30° E.
Buginda, see Bugundi.
Bugoie.—1° 45′ S., 29° 25′ E.
Bugundi.—0° 55′ N., 29° 50′ E.
Buhamba.—1° 30′ S., 29° 20′ E.
Bujongolo.—0° 20′ N., 29° 55′ E.
Bukama.—9° 20′ S., 25° 55′ E.
Bukende.—0° 50′ N., 29° 50′ E.
Bukendo, see Bukende.
Bukoba.—1° 30′ S., 32° S.
Bulabemba, see Banana.
Bulongo, see Bukama.
Bulwa.—5° S., 38° 40′ E.
Bumba.—2° 10′ N., 22° 30′ E.
Bumbide (I.).—2° S., 32° E.

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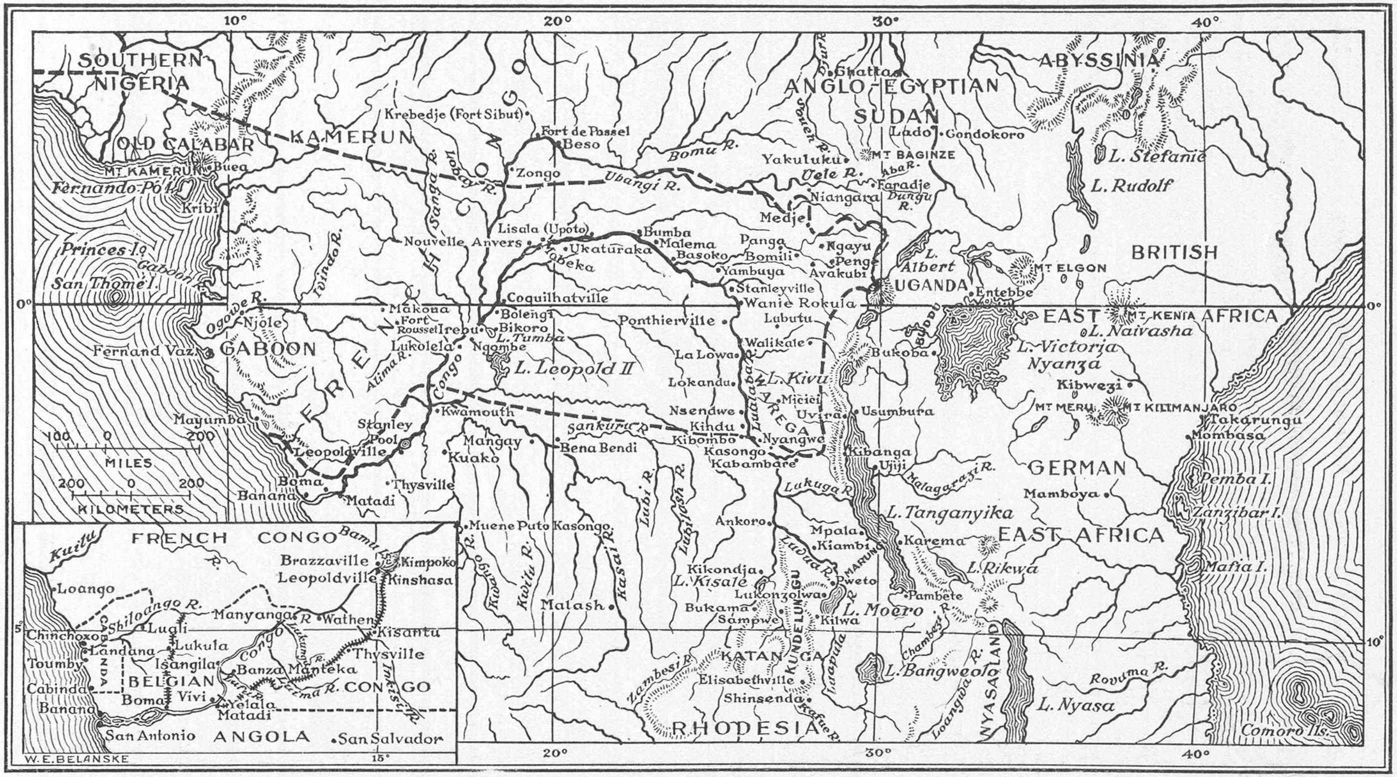
[1] F. Stuhlmann, 1894. Mit Emin Pascha ins Herz von Afrika. 2 vols.


10°
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OLD CALABAR
KAMERUN
MT KAMERUN
Buea
Fernando Po I.
Kribi
Princes I.
Gaboon R.
San Thome I.
Ogowe R.
Njole
GABOON
Fernand Vaz
Ivindo R.
FRENCH CONGO
Krebedje (Fort Sibut)
Fort de Possel
Beso
Zongo
Lobay R.
Sanga R.
Ubangi R.
Bomu R.
Nouvelle Anvers
Lisala (Upoto)
Bumba
Malema
Basoko
Ukaturaka
Yaoeka
Makoua
Fort Rousset
Irebu
Bikoro
Bolengi
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Lukolela
Ngombe
L. Leopold II
Alima R.
Congo R.
Kwamouth
Stanley Pool
Leopoldville
Mayumba
Boma
Banana
Matadi
Thysville
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Nsendwe
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Medje
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Faradje
Aba R.
Uele R.
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MT BAGINZE
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Jur R.
Shatta
ANGLO-EGYPTIAN SUDAN
Lado
Gondokoro
ABYSSINIA
L. Stefanie
L. Rudolf
BRITISH EAST AFRICA
MT ELGON
MT KENIA
L. Naivasha
L. Albert
UGANDA
Entebbe
Semliki R.
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Takarungu
Mombasa
Pemba I.
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L. Kivu
Micici
Uvira
REGA
Nyangwe
Usumbura
Kibanga
Ujiji
Malagarazi R.
Lukuga R.
L. Tanganyika
GERMAN EAST AFRICA
Mamboya
Karema
L. Rikwa
Pambete
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Pweto
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Kilwa
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Ankoro
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L. Kisale
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L. Bangweolo
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Rovuma R.
Zambesi R.
RHODESIA
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Lubilash R.
Kasai R.
Malash
Kwilu R.
Kwango R.
Muene Puto Kasongo
100 0 200 MILES
200 0 200 KILOMETERS
Kuilu
Loango
Shiloango R.
Chinchoxo
Landana
Luali
Lukula
Toumby
CABINDA
Cabinda
Banana
Boma
Vivi
Isangila
BELGIAN CONGO
Banza Manteka
Manyanga
Wathen
Kisantu
Thysville
Lukunga R.
Inkisi R.
Mpozo R.
Yelala
Matadi
Brazzaville
Leopoldville
Kimpoko
Kinshasa
Bamu I.
San Antonio
ANGOLA
San Salvador
5°
15°
W. E. BELANSKE

I. Map of Equatorial Africa showing localities where mollusks have been collected in the Congo Basin and their relation to the West African Rain Forest whose limits are marked by an interrupted line. For localities at the estuary of the Congo River and in the region between Lakes Kivu and Albert, see the larger scale maps pp. 15 and 17. (" Takarungu" should be spelled "Takaungu.")

Bundeko.—0° 50′ N., 29° 45′ E.
Burton (Gulf).—4° 20′ S., 29° 30′ E
Burunga.—1° 30′ S., 29° 20′ E.
Busisi.—2° 40′ S., 32° 45′ E.
Busoga.—0° 30′ N., 33° 30′ E.
Butagu (R.).—0° 30′ N., 29° 50′ E.
Butumbi.—0° 30′ S., 29° 40′ E.

Cabinda.—5° 35′ S., 12° 15′ E.
Chambezi (R.).—10° to 11° 30′ S., 31° to 32° E.
Chiloango (R.), see Shiloango (R.).
Chinchoxo.—5° 15′ S., 12° 15′ E.
Chiradzulu (Mt.).—15° 40′ S., 35° 10′ E.; 1676 m.
Chozi (R.).—9° 30′ S., 32° 20′ E.
Christiansborg.—5° 30′ N., 0°.

Darema, see Derema.
Derema.—5° 5′ S., 38° 40′ E.
Djuma (R.), see Kwilu (R.).
Djur (R.).—8° N., 28° E.
Duki (R.), see Shari (R.).
Dungu (R.).—3° 30′ N., 28° 30′ E.
Ekaturaka, see Ukaturaka.
Elau, see San Salvador.
Eldoma Ravine.—0°, 35° 45′ E.
Eléphant (Ile de l').—3° 40′ S., 16° E.
Elima.—5° 15′ N., 5° 30′ W.
Elisabethville.—11° 45′ S., 27° 40′ E.
Emin (Mt.).—0° 30′ N., 29° 55′ E.; 4815 m.
Entebbe.—0° 5′ N., 32° 30′ E.
Escarpment Station.—1° S., 36° 30′ E.

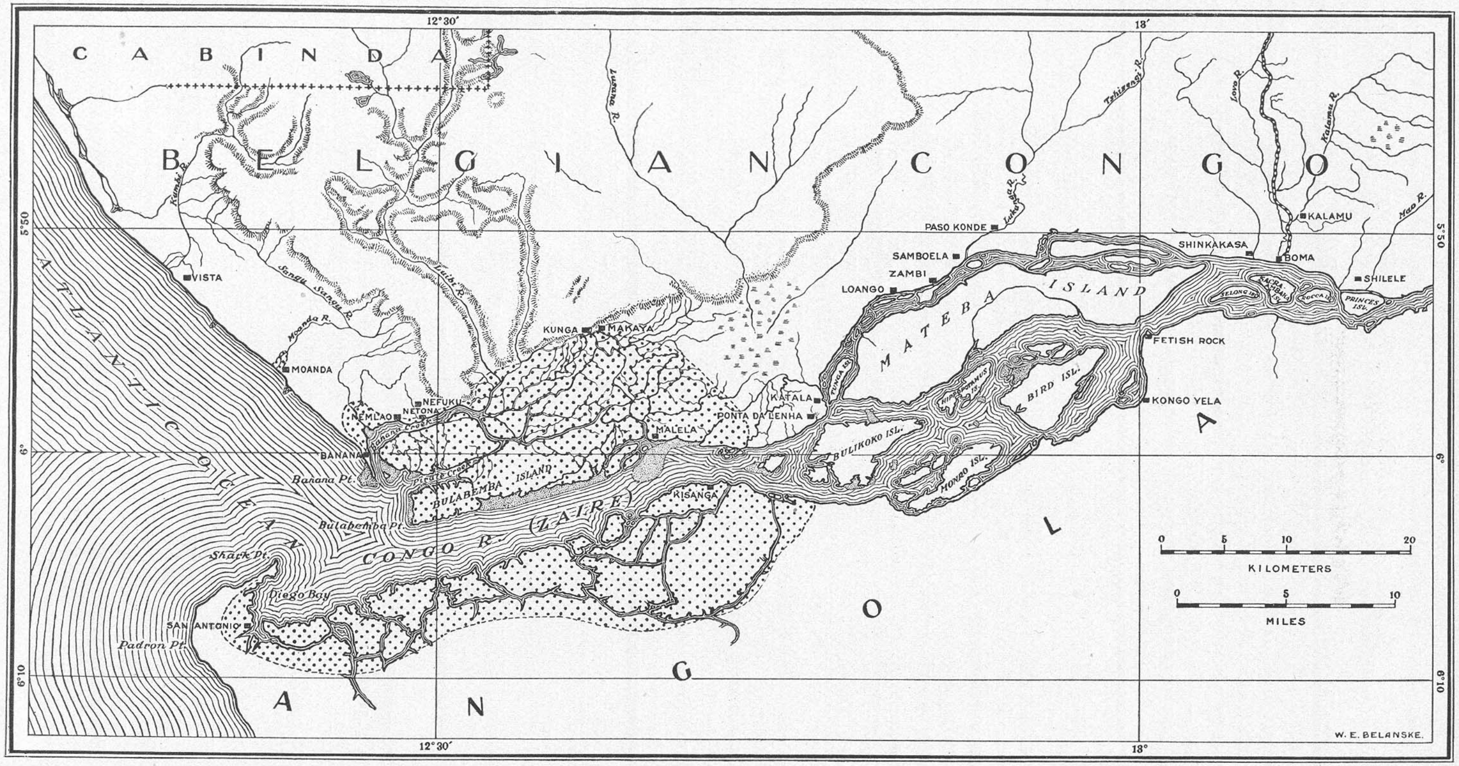
Faradje.—3° 40′ N., 29° 40′ E.
Fernando Po.—3° 30′ N., 8° 30′ E.
Fernand Vaz.—1° 40′ N., 10° E.
Fort de Possel.—5° N., 19° 15′ E.
Fort Portal.—0° 45′ N., 30° 15′ E.
Fort Rousset.—0° 30′ S., 16° E.
Fort Sibut, see Krebedje.

Gaboon (R.).—0° 10′ N., 9° E.
Gambia (R.).—13° 50′ N., 16° 30′ W.
Ganale (R.).—5° 50′ N., 40° 20′ E.
Gazelle (R.), see Bahr el Ghazal.
Gessi (Mt.).—0° 30′ N., 30° E.; 4769 m.
Ghattas.—7° 30′ N., 28° 30′ E.
Golungo Alto.—9° 5′ S., 14° 55′ E.
Goma.—1° 35′ S., 29° 15′ E.
Gondokoro.—4° 45′ N., 31° 35′ E.
Gribingui (R.).—7° to 9° N., 19° E.

Ibanda.—0° 20′ N., 30° 5′ E.
Inkisi (R.).—5° to 6° S., 15° 15′ E.
Irebu.—0° 35′ S., 17° 50′ E.
Iruma, see Irumu.
Irumu.—1° 20′ N., 30° E.
Isanghila, see Isangila.
Isangila.—5° 25′ S., 13° 30′ E.
Isasa (R.).—0° 30′ S., 29° 35′ E.
Issango (R.), see Semliki (R.).
Itiri (R.), see Semliki (R.).
Ituri (R.).—1° 30′ N., 26° to 30° E.
Ivindo (R.).—2° 20′ N., 13° E.
Iwinsa.—0° 40′ S., 29° 30′ E.
Iwinsi, see Iwinsa.

Jombene Hills.—0° 30′ N., 38° 15′ E.

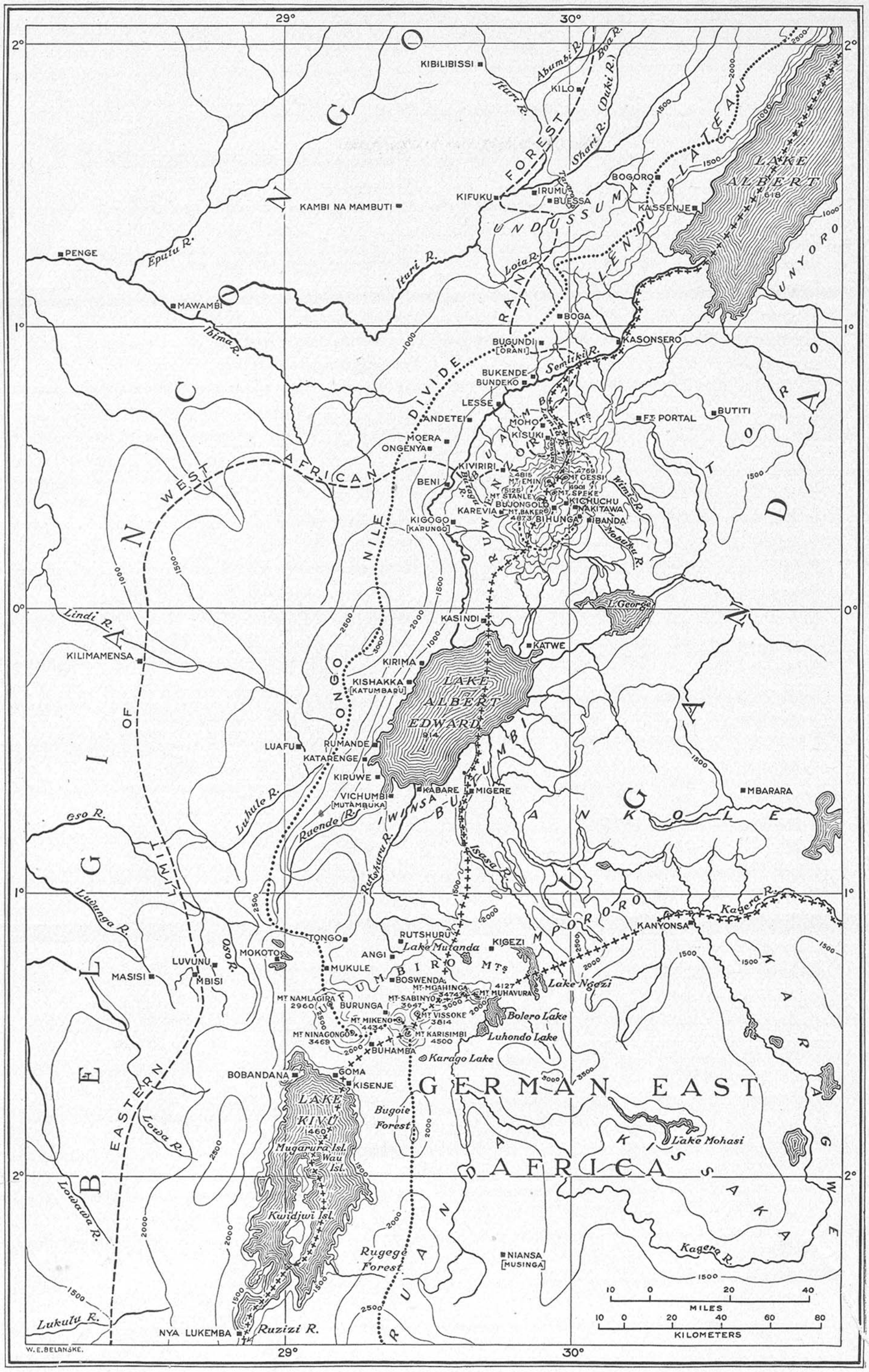
Kabamba (L.).—7° 45′ S., 27° E.
Kabambare.—4° 40′ S., 27° 45′ E.
Kabanga, see Kabanza.
Kabanza.—8° 15′ S., 26° 30′ E.
Kabare.—0° 35′ S., 29° 30′ E.
Kafuro.—1° 45′ S., 31° 15′ E.
Kagera (R.).—1° S., 30° 30′ E.
Kakombo.—7° 30′ S., 27° E.
Kakompo, see Kakombo.
Kala.—8° 10′ S., 31° E.
Kalassa.—11° 30′ S., 28° 30′ E.
Kalengwe.—9° 20′ S., 25° 50′ E.
Kalilo.—9° 35′ S., 28° 40′ E.
Kalungwesi (R.).—9° 10′ S., 29° 20′ E.
Kambi na Mambuti.—1° 20′ N., 29° 20′ E.
Kanem.—14° 30′ N., 14° E.
Kanyonsa.—1° 5′ S., 30° 30′ E.
Kapoya.—8° S., 28° E.
Kapoyo, see Kapoya.
Karago (L.).—1° 35′ S., 29° 30′ E.
Karagwa, see Karagwe.
Karagwe.—1° to 2° S., 31° E.
Karema.—6° 50′ S., 30° 30′ E.
Karevia.—0° 20′ N., 29° 40′ E.


12°30′
18′
CABINDA
BELGIAN CONGO
ANGOLA
ATLANTIC OCEAN
5°50
6°
6°10
12°30′
18°
Kumbi R.
Sangu Sangu R.
Moanda R.
Luibi R.
Lusana R.
Tshizongi R.
Lukunga R.
Lovo R.
Kalamu R.
Nao R.
VISTA
MOANDA
NEFUKU
NETONA
EMLAO
BANANA
Banana Pt.
Banana Creek
Pirate Creek
BULABEMBA ISLAND
Bulabemba Pt.
Shark Pt.
Diego Bay
SAN ANTONIO
Padron Pt.
CONGO R. (ZAIRE)
KUNGA
MAKAYA
MALELA
PONTA DA LENHA
KATALA
KISANGA
LOANGO
ZAMBI
SAMBOELA
PASO KONDE
MATEBA ISLAND
TUNGA ISL.
BULIKOKO ISL.
HIPPOPOTAMUS ISL.
BIRD ISL.
MONBO ISL.
FETISH ROCK
KONGO YELA
SHINKAKASA
BOMA
KALAMU
SHILELE
ZELONG ISL.
SACRA AMBACA ISL.
ROCCA ISL.
PRINCES ISL.
0 5 10 20
KILOMETERS
0 5 10
MILES
W. E. BELANSKE.

II Map of the estuary of the Congo River showing localities where mollusks have been collected. The dotted areas cover the extent of true mangrove-forest (*Rhizophora mangle* Linné), being the region periodically inundated by saline water at high tide.

Karewia, see Karevia.
Karisimbi (Mt.).—1° 30′ S., 29° 25′ E.; 4500 m.
Karissimbi (Mt.), see Karisimbi (Mt.).
Karungo, see Kigogo.
Kasai (R.).—3° to 10° S., 16° to 22° E.
Kasenga.—10° 15′ S., 28° 45′ E.
Kasindi.—0°, 29° 40′ E.
Kasongo.—4° 20′ S., 26° 25′ E.
Kasonsero.—1° N., 30° 10′ E.
Kassai (R.), see Kasai (R.).
Kassarosi (I.).—2° 25′ S., 32° 10′ E.
Kassenje.—1° 25′ N., 30° 30′ E.
Kassenye, see Kassenje.
Kassongo, see Kasongo.
Katarenga, see Katarenge.
Katarenge.—0° 30′ S., 29° 20′ E.
Katolo.—8° 15′ S., 27° 55′ E.
Katue, see Katwe.
Katumbaru, see Kishakka.
Katwe.—0° 5′ S., 29° 55′ E.
Kavirondo.—0°, 35° E.
Kawirondo, see Kavirondo.
Kaziba Ziba, see Bukama.
Kenangop (Mt.).—0° 35′ S., 36° 30′ E.; 4270 m.
Kenia (Mt.).—0° 20′ S., 37° 25′ E.; 5242 m.
Kiabwa.—7° 30′ S., 26° 50′ E.
Kiambi.—7° 20′ S., 27° 55′ E.
Kiambo, see Kiambi.
Kibanga.—4° 30′ S., 29° 10′ E.
Kibao.—7° S., 26° 50′ E.
Kibawa, see Kiabwa.
Kibilibissi.—1° 55′ N., 29° 35′ E.
Kibombo.—4° S., 26° E.
Kibondo.—10° S., 28° 50′ E.
Kibosho.—3° 15′ S., 37° 20′ E.
Kichuchu.—0° 20′ N., 30° E.
Kidete.—6° 40′ S., 36° 45′ E.
Kiduha.—1° 15′ S., 29° 40′ E.
Kifuku.—1° 20′ N., 29° 40′ E.
Kigezi.—1° 15′ N., 29° 40′ E.
Kigogo.—0° 20′ N., 29° 35′ E.
Kikondja.—8° 10′ S., 26° 25′ E.
Kilimandjaro (Mt.), see Kilimanjaro (Mt.).
Kilimanjaro (Mt.).—3° S., 37° 20′ E.; 6010 m.
Kilo.—1° 55′ N., 30° E.
Kilwa.—9° 20′ S., 28° 25′ E.
Kimpoko.—4° 10′ S., 15° 40′ E.
Kindu.—3° S., 26° E.
Kingani (R.).—6° 30′ S., 38° 35′ E.
Kinga (Mts.).—9° S., 34° E.
Kinshasa.—4° 20′ S., 15° 20′ E.
Kipochi.—11° 45′ S., 28° 30′ E.
Kirima.—0° 15′ S., 29° 30′ E.
Kiruwe.—0° 35′ S., 29° 25′ E.
Kisale (L.).—8° 15′ S., 26° 30′ E.
Kisantu.—5° 10′ S., 15° 10′ E.
Kisengi, see Kisenje.
Kisenje.—1° 35′ S., 29° 15′ E.
Kishakka.—0° 20′ S., 29° 30′ E.
Kismayu.—0° 20′ S., 42° 30′ E.
Kissenji, see Kisenje.
Kisuki.—0° 35′ N., 29° 55′ E.
Kitale (L.), see Kisale (L.).
Kitoto, see Port Florence.
Kiviriri.—0° 30′ N., 29° 40′ E.
Kivu (L.).—2° S., 29° E.; 1460 m.
Kiwu (L.), see Kivu (L.).
*Knicomba.—Southwest coast of L. Tanganyika.
*Koha ekjo.—West shore of L. Albert Edward.
Kome (I.).—2° 20′ S., 32° 30′ E.
Komba.—0° 15′ N., 32° 10′ E.
Kondoa.—5° S., 36° E.
Krebedje.—5° 55′ N., 19° E.
Kribi.—8° N., 5° 45′ E.
Kuako.—4° 15′ S., 16° 35′ E.
Kuango (R.), see Kwango (R.).
Kuilu (R.).—4° S., 12° E.
Kundelungu.-9° to 10° S., 28° E.; 1800 m.
Kunga.—5° 55′ S., 12° 35′ E.
Kwamouth.—3° 20′ S., 16° 10′ E.
Kwango (R.).—3° to 10° S., 17° E.
Kwidjwi (I.).—2° 10′ S., 29° 20′ E.
Kwidschwi (I.), see Kwidjwi (I.).
Kwilu (R.).—3° to 9° S., 17° to 20° E.

La Lowa.—1° 25′ S., 25° 45′ E.
Lamia (R.).—0° 35′ N., 30° E.
Landana.—5° 15′ S., 12° 15′ E.


29°
30°
2°
1°
0°
BELGIAN CONGO
GERMAN EAST AFRICA
UGANDA
ANKOLE
KARAGWE
KISSAKKA
RUANDA
UNYORO
TORO
RAIN FOREST
UNDUSSUMA
LENDU PLATEAU
EASTERN LIMIT OF WEST AFRICAN RAIN FOREST
CONGO NILE DIVIDE
RUWENZORI MTS
BUAMBA
BUTUMBI
BWISSA
MPORORO
UFUMBIRO MTS
KIBILIBISSI
KILO
BOGORO
IRUMU
BUESSA
KIFUKU
KASSENJE
KAMBI NA MAMBUTI
PENGE
MAWAMBI
BOGA
KASONSERO
BUGUNDI [ORANI]
BUKENDE BUNDEKO
LESSE
FT. PORTAL
BUTITI
ANDETEI
MOHO
KISUKI
MOERA
ONGENYA
KIVIRIRI
BENI
MT. EMIN 4815
MT. GESSI 4769
MT. STANLEY 5125
MT. SPEKE 5001
BUJONGOLO
KICHUCHU
KAREVIA
MT. BAKER 4873
BIHUNGA
NAKITAWA
IBANDA
KIGOGO [KARUNGO]
KASINDI
KATWE
L. George
KILIMAMENSA
KIRIMA
KISHAKKA [KATUMBARU]
LAKE ALBERT EDWARD 914
LAKE ALBERT 618
LUAFU
RUMANDE
KATARENGE
KIRUWE
VICHUMBI [MUTAMBUKA]
KABARE
MIGERE
MBARARA
TONGO
RUTSHURU
Lake Mutanda
KIGEZI
KANYONSA
ANGI
MUKULE
MOKOTO
LUVUNU
MASISI
MBISI
BOSWENDA
MT. MGAHINGA 4127
MT. SABINYO 3647
MT. MUHAVURA 4127
MT. NAMLAGIRA 2960
BURUNGA
MT. MIKENO 4434
MT. VISSOKE 3814
MT. NINAGONGO 3469
MT. KARISIMBI 4500
BUHAMBA
Lake Ngezi
Bolero Lake
Luhondo Lake
Karago Lake
BOBANDANA
GOMA
KISENJE
LAKE KIVU 1460
Mugarura Isl.
Wau Isl.
Kwidjwi Isl.
Bugoie Forest
Rugege Forest
Lake Mohasi
NIANSA [MUSINGA]
NYA LUKEMBA
Ruzizi R.
Lukulu R.
Lowa R.
Lowawa R.
Luwunga R.
Oso R.
Eso R.
Lindi R.
Luhule R.
Ruende R.
Rutshuru R.
Isasa R.
Kagera R.
Ituri R.
Epulu R.
Ibima R.
Abumbi R.
Boa R.
Shari R. (Duki R.)
Loia R.
Semliki R.
Wimi R.
Mubuku R.
10 0 20 40 MILES
10 0 20 40 60 80 KILOMETERS
W. E. BELANSKE.

III. Map of Central Africa, between Lakes Kivu and Albert, showing localities where mollusks have been collected. The interrupted line (----------) is the eastern limit of the continuous Rain Forest and shows the connection between this West African forest and the lower mountain forest of Mt. Ruwenzori. The Congo-Nile divide is marked by a dotted line (......). The political boundaries (+ + + +) are those in use at the beginning of 1914. Altitudes are given in meters.

Landiani.—0°, 35° 40′ E.
Lanuri (R.).—0° 35′ N., 29° 55′ E.
Lendu.—1° to 2° N., 30° to 30° 30′ E.
Leopoldville.—4° 25′ S., 15° 20′ E.
Lesse.—0° 20′ N., 29° 40′ E.
Lisala.—2° 10′ N., 21° 30′ E.
Lissala, see Lisala.
Loanda (St. Paul de).—8° 55′ S., 13° 10′ E.
Loango.—4° 35′ S., 11° 45′ E.
Loangwa (R.).—11° to 16° S., 30° to 33° E.
Lobay (R.).— 4° 15′ S., 18° E.
Lobaye (R.), see Lobay (R.).
Lofoi (R.).—10° 15′ S., 27° 30′ E.
Loia (R.).—1° 15′ N., 29° 45′ E.
Lokandu.—2° 35′ S., 25° 45′ E.
Loukoungou, see Lukungu (R.).
Lovoi (R.).—8° 10′ S., 26° 20′ E.
Lowa (R.).—1° 20′ S., 26° to 29° E.
Lualaba (R.).—1° to 12° S., 25° to 27° E.
Luali.—5° S., 12° 25′ E.
Luapula (R.).—9° to 12° S., 29° E.
Lubemba (R.), see Lubembe (R.).
Lubembe (R.).—12° S., 28° 30′ E.
Lubi (R.).—5° 30′ S., 23° 20′ E.
Lubilash (R.), see Sankuru (R.).
Lubumbashi (R.).—11° 45′ S., 27° 40′ E.
Luembe (R.), see Lubembe (R.).
Lufira (R.).—11° 30′ S., 26° 45′ E.
Lufoi (R.), see Lofoi (R.).
Lufu (R.).—5° 40′ S., 14° E.
Luhondo (L.).—1° 30′ S., 29° 40′ E.
Luima (R.).—5° 25′ S., 14° E.
Lukete.—8° S., 28° E.
Lukolela.—1° 10′ S., 17° 10′ E.
Lukonzolwa.—8° 50′ S., 28° 40′ E.
Lukuga (R.).—6° S., 27° to 29° E.
Lukula.—5° 25′ S., 13° E.
Lukungu (R.).—5° S., 14° 15′ E.
Luquela (R.), see Lubembe (R.).
Luvua (R.).—7° to 8° S., 27° to 29° E.
Luvunu.—1° 20′ S., 28° 45′ E.
Luwua (R.), see Luvua (R.).

Mabuku (R.), see Mobuku (R.).
Makaya.—5° 55′ S., 12° 35′ E.
Makdischu.—2° N., 45° 30′ E.
Makoua.—0° 5′ N., 15° 35′ E.
Malagarazi (R.).—5° 10′ S., 30° E.
Malange.—9° 35′ S., 16° 25′ E.
Malash.—9° S., 22° E.
Malela.—6° S., 12° 40′ E.
Malema.—2° N., 21° 30′ E.
Mamboia, see Mamboya.
Mamboya.—6° 30′ S., 37° E.
Mangay.—4° S., 19° 30′ E.
Manghay, see Mangay.
Manyanga.—4° 50′ S., 14° 25′ E.
Manyema.—3° to 5° S., 26° to 29° E.
Manyonyo.—0° 15′ N., 32° 40′ E.
Masaka.—0° 20′ S., 31° 45′ E.
Mascaia Massurungo, see Makaya.
Masisi.—1° S., 28° 30′ E.
Matadi.—5° 50′ S., 13° 35′ E.
Matambuku, see Vichumbi.
Mawambi.—1° 10′ N., 28° 45′ E.
Mayumba.—3° 10′ S., 10° 40′ E.
Mbagba.—4° N., 18° E.
Mbaiki.—3° 55′ N., 18° E.
Mbamu, see Bamu (I.).
Mbarara.—0° 40′ S., 30° 35′ E.
Mbisi.—1° 20′ S., 28° 40′ E.
Mboga, see Boga.
Medje.—2° 25′ N., 27° 30′ E.
Melella, see Malela.
Meru (Mt.).—3° 15′ S., 36° 45′ E.; 4730 m.
Mfumburu (Mts.), see Ufumbiro (Mts.).
Mgahinga (Mt.).—1° 25′ S., 29° 40′ E.; 3474 m.
Micici.—3° S., 27° E.
Migere.—0° 40′ S., 29° 40′ E.
Mikeno (Mt.).—1° 30′ S., 29° 25′ E.,; 4434 m.
Milobo, see Mwana Milongo.
Mjongo, see Manyonyo.
Moanda.—5° 55′ S., 12° 25′ E.
Mobeka.—2° N., 19° 50′ E.
Mobuku (R.).—0° 20′ N., 30° 15′ E.
Moera.—0° 35′ N., 29° 30′ E.
Moero (L.).—9° S., 29° E.; 925 m.
Mohasi (L.).—1° 50′ S., 30° 20′ E.
Moho.—0° 35′ N., 29° 55′ E.
Moipungoi.—8° 45′ S., 26° 5′ E.
Mokoto.—1° 15′ S., 29° E.
Mombas, see Mombasa.
Mombasa.—4° S., 39° 50′ E.

Monrovia.—6° 30′ N., 10° 50′ W.
Mpala.—6° 45′ S., 29° 20′ E.
Mpwapwa.—6° 20′ S., 36° 25′ E.
Msassa.—4° 50′ S., 31° 20′ E.
Muene Puto Kasongo.—6° 30′ S., 16° 15′ E.
Mufumbi.—11° S., 28° 30′ E.
Mufungwa, see Sampwe.
Mugarura (I.).—1° 55′ S., 29° 5′ E.
Muhavura (Mt.).—1° 25′ S., 29 ° 45′ E. 4127 m.
Mukanda.—1° 35′ S., 29° 15′ E.
Mukule.—1° 20′ S., 29° 10′ E.
Mulongo.—7° 45′ S., 27° E.
Muombe.—9° S., 27° 30′ E.
Murchison Bay.—0° 10′ N., 32° 40′ E.
*Musungu Kifuluka.—Near Nyangwe.
Mutambuka, see Vichumbi.
Mutanda (L.).—1° 15′ S., 29° 40′ E.
Muyumbwe.—8° 30′ S., 26° 5′ E.
*Mvula (I.).—Near La Lowa or Nsendwe.
Mwana Milongo.—4° 25′ S., 26° 25′ E.
Mweru (L.), see Moero (L.).
Mweru (Mt.), see Meru (Mt.).
Mwutan Nsige, see Lake Albert.

Nabambisso (R.).—4° 45′ N., 28° 40′ E.
Nabumbisso (R.), see Nabambisso (R.).
Nairobi.—1° 10′ S., 36° 45′ E.
Naivasha (L.)—0° 40′ S., 36° 30′ E.
Nakitawa.—0° 25′ N., 30° E.
Nakuru (L.).—0° 25′ S., 36° 10′ E.
Namlagira (Mt.).—1° 25′ S., 29° 10′ E.; 2960 m.
Nefuku.—5° 55′ S., 12° 30′ E.
Nemlao.—5° 55′ S., 12° 30′E.
Netona.—5° 55′ S., 12° 30′ E.
Ngadda (R.).—8° N., 4° E.
Ngami (L.).—20° 50′ S., 22° 30′ E.
Ngayu.—1° 40′ N., 27° 40′ E.
Ngesi, see Lake Albert Edward.
Ngombe.—0° 35′ S., 17° 50′ E.
Niangara—3° 40′ N., 27° 50′ E.
Niemba Kunda.—7° 30′ S., 28° E.
Ninagongo (Mt.).—1° 30′ S., 29° 20′ E.; 3469 m.
Niragongo (Mt.), see Ninagongo (Mt.).
Njangwe, see Nyangwe.
Nouvelle Anvers.—1° 40′ N., 19° 10′ E.
Nsendwe.—3° 5′ S., 26° E.
Ntebbi, see Entebbe.
Ntoc (R.).—3° 10′ S., 10° 4′ E.
N'Tumbo, see Toumby.
Nyangwe.—4° 15′ S., 26° 15′ E.
Nyanza Oukéréwé, see Victoria Nyanza.
Nyika, see Unyika.
Nyiro (Mt.).—2° N., 37° E.

Ogowe (R.).—1° S., 10° E.
Ongenya.—0° 30′ N., 29° 30′ E.
Orani, see Bugundi.
Oransi, see Bugundi.
Oubangui, see Ubangi (R.).
Oubouari, see Ubuari.
Ouelle (R.), see Uele (R.).
Oukéréwé, see Victoria Nyanza.

Pala, see Mpala.
Palmas (Cape).—4° 30′ N., 7° 30′ W.
Pambete.—8° 50′ S., 31° E.
Panga.—1° 45′ N., 26° 15′ E.
Pasikonde, see Pasokonde.
Pasokonde.—5° 50′ S., 11° 55′ E.
Penge.—1° 25′ N., 28° 15′ E.
*Piani Kapuri.—On the Lualaba.
Ponta da Lenha.—6° S., 12° 45′ E.
Ponthierville.—0° 25′ S., 25° 30′ E.
Port Florence.—0° 5′ S., 34° 45′ E.
Povo Netonna, see Netona.
Prince's Island.—1° 35′ N., 7° 20′ E.
Pungo Andongo.—9° 50′ S., 15° 30′ E.
Pweto.—8° 30′ S., 28° 55′ E.

Quango (R.), see Kwango (R).
Quanza (R.). 96 to 10° S., 13° to 16° E.
Quiaposa (R.).—9° 30′ S., 14° 30′ E.

Rek (R.).—8° N., 29° E.
Rekwa (L.), see Rikwa (L.).
Rift Valley.—0°, 36° E.
Rikwa (L.).—8° S., 32° 40′ E.
Rodolphe (L.), see Rudolf (L.).
Ruanda.—2° S., 29° 50′ E.
Rudolf (L.).—4° S., 36° E.
Rugege.—2° 25′ S., 29° 20′ E.
Rumande.—0° 30′ S., 29° 20′ E.

Runssoro (Mt.), see Ruwenzori (Mt.).
Rusisi (R.), see Ruzizi (R.).
Rutshuru.—1° 15′ S., 29° 30′ E.
Rutshuru (R.).—1° S., 29° 25′ E.
Rutshurru, see Rutshuru.
Ruwenzori (Mt.).—0° 30′ N., 29° 50′ E.
Ruzizi (R.).—3° S., 29′ E.

Sabinjo (Mt.), see Sabinyo (Mt.).
Sabinyo (Mt.).—1° 25′ S., 29° 35′ E.; 3647 m.
Samboela.—5° 50′ S., 12° 55′ E.
Sambourou, see Samburu.
Samburu.—3° 40′ S., 38° 55′ E.
Sampwe.—9° 30′ S., 27° 25′ E.
San Antonio.—6° 10′ S., 12° 20′ E.
Sanga (R.).—5° N. to 1° S., 16° to 17° E.
Sangha (R.), see Sanga (R.).
Sangwe, see Sampwe.
Sankurra (R.), see Sankuru (R.).
Sankuru (R).—4° to 10° S., 21° to 22° E.
San Salvador.—6° 20′ S., 14° 35′ E.
Sassandra (R.).—5° to 9° N., 9° W.
Semliki (R.).—0° to 1° N., 29° 30′ to 30° E.
Sesse (I.).—0° 25′ S., 32° 30′ E.
Shari (R.).—1° 40′ N., 30° 10′ E.
Sheriba Ghattas, see Ghattas.
Shiloango (R.).—5° S., 12° to 13° E.
Shimbi Hills.—4° 10′ S., 39° 30′ E.
Shinsenda.—12° 25′ S., 28° E.
Shisenda, see Shinsenda.
Soubré.—5° 45′ N., 8° 50′ W.
Soueh (R.).—5° N., 28° 30′ E.
Speke (Mt.).—0° 25′ N., 29° 55′ E.; 4901 m.
Ssemliki (R.), see Semliki (R.).
Stanley (Mt.).—0° 25′ N., 29° 55′ E.; 5125 m.
Stanley Falls, see Stanleyville.
Stanley Pool.—4° 15′ S., 15° 30′ E.
Stanleyville.—0° 30′ N., 25° 15′ E.
Sueh (R.), see Soueh (R.).

Takaungu.—3° 42′ S., 39° 55′ E.
Tanganika (L.), see Tanganyika (L.).
Tanganjika (L.), see Tanganyika (L.).
Tanganyika (L.).—3° to 9° S., 29° to 31° E.
Tararo (R.).—1° 30′ N., 30° E.
Tekanini.—8° 50′ S., 27° 30′ E.
Tete (Chari).—9° N., 21° E.
Tete (Zambesi).—16° 10′ S., 33° 30′ E.
Tette, see Tete (Zambesi).
Thysville.—5° 30′ S., 15° E.
Tongo.—1° 10′ S., 29° 15′ E.
Toro, see Fort Portal.
Toumby.—5° 15′ S., 12° 15′ E.
Trebu, see Irebu.
Tshiloango (R.), see Shiloango (R.).
Tumba (L.).—0° 45′ S., 18° E.

Ubangi (R.).—0° to 5° N., 18° to 23° E.
Ubembe.—4° 30′ S., 28° 45′ E.
Ubuari.—4° 15′ S., 29° 15′ E.
Udjiji, see Ujiji.
Uele (R.).—3° 30′ N., 23° to 30° E.
Ufumbiro (Mts.).—1° 25′ S., 29° 30′ E.
Ugalla (R.).—5° 45′ S., 31° 30′ E.
Ugogo.—6° S., 36° E.
Ujiji.—4° 55′ S., 29° 40′ E.
Ukami.—7° S., 38° E.
Ukaturaka.—2° N., 20° 30′ E.
Ukinga.—9° 15′ S., 34° 10′ E.
Undussuma.—1° 20′ N., 30° E.
Unyika Plateau.—9° S., 33° E.; 2500 m
Upoto, see Lisala.
Usagara.—7° to 8° E., 36° to 37° E.
Usambara.—5° 50′ S., 38° 40′ E.
Usoga, see Busoga.
Usumbura.—3° 20′ S., 29° 25′ E.
Uvira.—3° 25′ S., 29° 10′ E.
Uwira, see Uvira.

Vichumbi.—0° 40′ S., 29° 20′ E.
Victoria Falls.—18° S., 25° 50′ E.
Victoria Nyanza.—0° to 3° S., 32° to 34° E.; 1132 m.
Vieux Kassongo.—4° 30′ S., 26° 35′ E.
Vissoke (Mt.).—1° 10′ S., 29° 30′ E.; 3814 m.
Vitschumbi, see Vichumbi.
Vivi.—5° 45′ S., 13° 35′ E.

Walikale.—1° 25′ S., 28° E.
Wanie Lukula, see Wanie Rokula.
Wanie Rokula.—0° 15′ N., 25° 30′ E.

Warega.—3° 15′ S., 26° to 27° E.
Waregga, see Warega.
Wathen.—5° S., 14° 35′ E.
Wau (I.).—1° 55′ S., 29° 10′ E.
Wembere Steppe.—4° 10′ S., 34° 15′ E.
Wimi (R.).—0° 30′ N., 30° 15′ E.
Wimpoko, see Kimpoko.
Wingo, see San Salvador.

Yakuluku.—4° 20′ N., 28° 50′ E.
Yambuya.—1° 20′ N., 24° 50′ E.
Yelala.—5° 45′ S., 13° 40′ E.

Zambesi (R.).—12° to 18° S., 23° to 36° E.
Zambi.—6° S., 12° 50′ E.
Zanzibar.—6° S., 39° 30′ E.
Zomba Plateau.—15° 20′ S., 35° 20′ E.; 2100 m.
Zongo.—4° 20′ N., 18° 35′ E.

REVIEW OF BIBLIOGRAPHY

The various explorers who from 1850 to 1880 crossed parts of the territory covered by the present colony of the Belgian Congo did not pay any special attention to mollusks. Only some of the large, more striking forms were occasionally collected by Schweinfurth,[1] Cameron, Capello and Ivens, Buchner, and others. The first to make an attempt at serious malacological collecting was Paul Hesse, who resided in Banana from 1884 to 1887; his land mollusks, all from the Lower Congo, have been worked up by C. R. Bœttger.[2] This paper contains many errors; some of the identifications can hardly be taken seriously unless confirmed from other sources. In 1897, E. Dupont collected a few species in the region between the mouth of the Congo and the confluence of the Kasai; these were studied by Dautzenberg.[3] A large part of the records from the Middle Congo are contained in a long series of papers by Louis Germain,[4] dealing chiefly with collections from French territory. For the Upper Congo, from the Stanley Falls to the Manyema, Dupuis and Putzeys have published a series of useful articles, in which are also recorded a few species from the Kasai region.[5] The eastern border about Lakes Albert and Albert Edward, the Upper Ituri, the Semliki, and Ruwenzori regions, are covered by E. v. Martens' great work on the mollusks of German East Africa,[6] the most extensive and generally useful work on the East African mollusk fauna. Another paper in the same publication, by Simroth,[7] deals with the slugs of that general region. As far as Congo material is concerned, Simroth's and v. Martens' specimens were all collected by Stuhlmann on his journey with Emin Pasha in 1891-1892. The mollusks of Mt. Ruwenzori and its eastern approach are further described in C. Pollonera's account of the collections of the Duca degli Abruzzi[1] and in E. A. Smith's paper on the results of the English Ruwenzori Expedition (1905-06).[2] From the same regions, as well as from farther south about Lake Kivu, Schubotz supplied material for a useful paper by J. Thiele.[3] More recently, many species were taken by Robin Kemp in the volcano region, north of Lake Kivu; they were described by H. B. Preston.[4] Three small papers by Dautzenberg[5] and one by S. I. Da Costa[6] describe additional Congo species. Finally, the collections made by J. Bequaert along the Congo River and in the Katanga have been worked up by Dautzenberg and Germain[7] in a valuable paper on this hitherto almost unknown district.

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[1] *Achatina schweinfurthi* v. Martens, from Mt. Baginze, was probably the first land snail collected in the Belgian Congo.

[2] 1913, Zur Molluskenfauna des Kongogebiets. Ann. Soc. Malacol. Belgique, XLVII, (1912), pp. 89-118, Pl. II.

[3] E. Dupont and Ph. Dautzenberg, 1891, Bull. Ac. Belgique, (3) XX, (1890), pp. 559-579, Pls. I-III.

[4] 1904-1917, Bull. Mus. Hist. Nat. Paris.

[5] 1898-1901, Ann. Soc. Malacol. Belgique; these specimens were all collected by Dupuis.

[6] 1897, Deutsch Ost Afrika, IV, Beschalte Weichthiere, pp. 1-308, Pls. I-VII.

[7] 1897, Deutsch Ost Afrika, IV, Nacktschnecken, pp. 1-23, Pls. I-III.

SUGGESTIONS TO COLLECTORS

To the student of other tropical faunas, that of the Congo appears ill-balanced by the great number of rapacious snails (Streptaxidæ) and even more by the infrequency of minute snails, such as Pupillidæ (none reported), Endodontidæ (two species), and minute Zonitidæ, also small and minute operculate snails, known only by one *Ditropis* and a *Cyathopoma*.

It may be that such snails are rare but, as yet, they have not been specially looked for. Forest and rock débris must be gathered and dried, the coarse material rejected and the residue packed in sacks to be sieved and picked over subsequently. The flood débris lodged along streams often supplies species otherwise overlooked. It is useless to assort this in the field, as the minutiæ will surely be overlooked. A scoop of fine mesh and a crowfoot dredge should be used for aquatic forms. A small dredge with copper wire net, on a stout line, can often be used from the shore to advantage.

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[1] 1906-1907, Boll. Mus. Zool. Anat. Comp. Torino; 1909, Il Ruwenzori, Parte Scientif., I, pp. 181-205, 5 Pls.

[2] 1909, Trans. Zool. Soc. London, XIX, pp. 43-47, Pl. I.

[3] 1911, Mollusken der Deutschen Zentralafrika-Expedition, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, pp. 175-214, Pls. IV-VI.

[4] 1912-1914, Proc. Zool. Soc. London; 1913, Revue Zoologique Africaine, III.

[5] 1900, Ann. Soc. Malacol. Belgique, Mém., XXXIV (1899), pp. 27-28; 1901, *op. cit.*, XXXVI, pp. 1-7, Pl. I; 1907, Journ. de Conchyl., LV, pp. 327-341, Pls. IV-VI.

[6] 1907, Proc. Malacol. Soc. London, VII, pp. 226-227, Pl. XX.

[7] 1914, Rev. Zool. Afric., IV, pp. 1-73, Pls. I-IV.

The use of such methods must result in a material increase of data with consequent modifications of our ideas of zoogeography.

Those Helicidæ and Zonitidæ in which the shell is extremely thin or partially uncalcified require special treatment. Part of the catch should be bottled in water until dead (twelve hours or more) and some of the shells removed. This can be done while the tissues are relaxed, but not after they have been hardened in alcohol. The shells may be stuffed with cotton, if necessary, and dried, or they may be left in alcohol. As a rule, the soft parts of all such snails as the *Helixarions* should be preserved. The shells alone are of small value. Science is not advanced much by the description of species of which the affinities cannot be determined. Indeed, this applies in some degree to almost all snails of unspecialized helicoid form.

Small, slender, or many-whorled snails intended for anatomical examination should be drowned and extended before pickling. It is not possible to dissect satisfactorily such snails as "*Ennea*," *Subulina*, and others of this form when hardened and retracted far into the shell. Larger snails, such as *Achatina*, are also far more useful if drowned before preservation in alcohol. While the smaller forms should be given preference when space is limited, more of the larger should certainly be brought home in alcohol. Some common genera, such as *Perideriopsis*, have never been dissected, and the classification of many groups must remain tentative until the soft anatomy of numerous species can be studied comparatively.

Small mollusks should never be preserved in formalin, and large ones only when spirit is not obtainable. Slugs are best thrown in 50 to 70 per cent alcohol without cleansing off the mucous excretions, and without making cuts in the skin. It is recommended to place them at first in a larger quantity of preservative; a few days later they can be packed in smaller vials with fresh 70 per cent alcohol.

Suggestions for the direction of collectors are almost superfluous, since no part of the Belgian Congo can be considered well worked up. Even on Mt. Ruwenzori and in the Lower Congo each new collection has added further species and even genera.

The vast valley of the Kasai and its affluents is practically unexplored for shells. A rich fauna of exceptional interest will probably be found along the Congo-Angola boundary, where the rivers flowing north emerge from the high land of the Angola back country.

"The animal of the large *Achatina* and *Burtoa* is most easily removed from the shell by being boiled and allowed to stand in the water until cool; if withdrawn when still hot the epidermis of the shell is liable to scale off. The process can be hastened, however, by the addition of cold water. Smaller snails thus treated draw into their shells beyond reach and are often dislodged with difficulty; the best results were obtained by putting *Limicolaria* and *Perideriopsis* in a jar or wide-mouthed bottle, completely filled with water, thus depriving them of fresh air. The vessel is then closed and placed in the sun, and as the temperature of the water increases the snails are forced to come out; they die soon, swelling considerably, and jars, therefore, should not be entirely filled with shells, allowing sufficient space for expansion. This process depends on the temperature and one ought to know that snails are most easily pulled out just before decomposition sets in, otherwise the soft terminal whorls tear off readily and can only be detached by vigorous shaking. A slightly hooked and bent wire often helps to remove them. A similar swelling process offers many advantages when specimens are to be preserved in alcohol, and ammonia added to the water will have the same effect on the large *Achatinæ*. All small species are preferably preserved in alcohol, for they are difficult to clean and mould quickly, destroying the fresh appearance of the shell. Shells, of course, should be carefully dried in the shade before packing and a small amount of oil will prevent deterioration of color through moisture. Dry moss or sawdust is an excellent material for packing; pads of moss stuffed into the opening of the shell protect the brittle edges" [H. L.].

RELATIONS OF THE CONGO LAND MOLLUSK FAUNA TO THE FAUNAS OF ADJACENT REGIONS

The characteristics and relationships of the tropical African mollusk fauna will be considered in the second paper of this series, which will deal with the aquatic forms, but the relations of the Congo land snails to those of adjacent regions may be briefly discussed here.

The land-snail fauna of the Belgian Congo is by no means homogeneous, having representatives of three faunal divisions, in all of which the areas of most intense evolution lie outside of the Congo Valley. While fresh-water faunas require large river or lake systems of long duration for rich development, the active centers of evolution for land mollusks are invariably in and about mountain regions.

1. The whole extreme eastern border of the Belgian Congo has an East African land-snail fauna. From the Uele to Manyema a majority

of the species are either identical with or related to those found eastward, in the area of intense local speciation between and around Lakes Albert, Tanganyika, and Victoria. In the Katanga, beyond the limit of the Rain Forest, the character of the fauna is not greatly changed, but the *Achatinæ* at least are similar to those of Angola, the aspect being East African. In all this region between the Upper Congo and the eastern border, from Stanleyville and the Ituri to the Katanga, only four species also occurring on the West Coast and in the Lower Congo have been reported. These do not by any means represent the full extent of the western element, which would be better expressed by the ranges of genera and subgenera. Thus *Ptychotrema*, which extends into the Great Lake district, is mainly a West African group. *Perideriopsis*, of the Upper Congo, is thought to be related to the West African *Pseudotrochus*, and the few species of *Callistoplepa* are from places as remote as the Kamerun and Katanga. That the genus had a West African origin is likely. Most of the Ituri species of *Homorus* seem most nearly related to West African species.

The eastern forest border appears to have faunules containing many special or local species, and changing more rapidly along meridians than east and west. The region of the Ituri and lower slopes of Mt. Ruwenzori differs a good deal from that between Lakes Albert Edward and Kivu, in Uganda and the Belgian Congo; and this again from the northwestern Tanganyika and Manyema regions. Part of the differences observed are doubtless real and correlated with topographic features; but certainly a considerable part is due to the direction of routes of travel and the absence of collections from intermediate stations. Many species now known from single or few localities will surely prove to be far more widely distributed; so that, with further investigation, the appearance of zones of endemic species will probably be diminished.

2. The southern border of what may be called the West African tropical fauna is defined by the limit of the Rain Forest, but of the most characteristic genera (such as *Archachatina*, *Pseudachatina*, *Pseudotrochus*) only one species of the last-named genus perhaps reaches the Congo. The fauna is most typically developed from Liberia to the Kamerun and on the islands of the Guinea Gulf. The Lower Congo is at or near the southern limit of this fauna. Data for determining the eastern border of this fauna are lacking. There is doubtless a very wide transition zone where the eastern and western faunas mingle, on both sides of the eastern boundary of the Belgian Congo.

3. The snails of Angola are quite imperfectly known, and mainly by the larger forms. There is little trace of the West African tropical fauna, the relationships of the species being with East Africa, so far as made out. The *Achatinæ* in particular appear to be allied to those of the Katanga and eastward. The arid regions of German Southwest Africa limit the Angolan fauna southward. A few Angolan species extend into the Lower Congo.

SYNOPSIS OF CLASSIFICATION

Since zoogeographic inquiries are directly dependent upon a phylogenetic classification, the opportunity offered by this material has been taken to make anatomical and taxonomic studies on several families, especially the Helicidæ, Streptaxidæ, and Zonitidæ. For the convenience of traveller-naturalists, and perhaps others, most of the genera are more or less briefly defined in the text, and a synopsis of the classification of the families and higher groups of Gastropoda involved is given below in the form of a key.

In treating of modifications lower than specific, a distinction has been made between (1) those of racial value, or *subspecies* in the sense of forms characteristic of geographic areas or habitats,[1] and (2) the different forms (*mutations* of de Vries) occuring together in the same colonies and doubtless interbreeding; the latter are often more diverse than different subspecies, frequently show no intermediate individuals, and have sometimes been described as distinct species, as in the case of *Achatina tincta* and its mutation *oblitterata.*

Mutations very often differ from the parent species only by the loss of a character. Thus, in several genera of Achatininæ, where zigzag stripes appear to be an old character, a common mutation is produced by loss of such markings. Sometimes a character is added, as the rose color of the columella in *Achatina tincta* mut. *oblitterata.* Very often species of the same genus mutate in the same way. The distinction should be expressed in nomenclature by the use of a trinomial for subspecies only, named mutations being distinguished by prefixing the word "mutation" or "mut." In dimorphic or polymorphic colonies where there is a good segregation of the mutations, it seems desirable to have distinctive names for them.

The above suggestions are, of course, not new but are introduced here merely because this treatment of variation has not before been used in dealing with African mollusks. The term "var." has hitherto covered all deviations from what an author considered normal for the species, whether for races occupying different areas or stations or for the mutations in single colonies.

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[1] While it appears likely that some "geographic races" are merely somatic modifications due to reactions of environment on the individual, the observations of Sumner indicate that they are often germinal.

1. Orthoneurous gastropods having the sexes united in the same individual, and breathing air by a pouch-like lung opening by a small orifice (pneumostome). Usually provided with a shell without operculum. Most species terrestrial or in shallow water. Order PULMONATA..............................2.

   Streptoneurous gastropods, having the sexes in separate individuals, breathing by branchiæ in a chamber under the mantle, broadly open in front. Shell generally present and operculate. Mainly aquatic, but those here considered are terrestrial, the gill chamber vascularized to breathe free air. Order PECTINIBRANCHIATA..14.

2. Mantle attached to only part of the upper surface, leaving the foot free. Openings of male and female ducts united or contiguous. (Lissopoda Simroth).. 3.

   Entire surface, except the sole and the head, covered with a leathery integument. Openings of male and female ducts remote (Soleolifera Simroth). Suborder Ditremata..13.

3. Four tentacles, the upper pair invertible, bearing the eyes at their summits. Male and females ducts uniting in a common genital orifice. Land snails. Suborder Stylommatophora.......................................4.

   Two tentacles, the eyes sessile near their bases. Openings of the genital ducts separate but contiguous. Kidney having a direct ureter. Chiefly aquatic snails. Suborder Basommatophora.

4. Ureter reflexed, passing around the base of the lung and following the intestine to the exterior; rarely opening at the base of the lung. Jaw, when present, without an accessory quadrate piece above (Sigmurethra)................5.

   Kidney forming the posterior border of the lung, lying transverse to heart and intestine, its apex against the latter, the ureter following the last fold of the intestine to the mantle-edge. Jaw having an accessory quadrate piece above (Heterurethra)..11.

   Kidney lying parallel to the heart, the ureter running directly forward, as in the Basommatophora. Jaw without an accessory plate (Orthurethra).......12.

5. Having pedal grooves above the foot margins. Superfamily Aulacopoda.....9.

   Without longitudinal grooves above the margins of the foot. Sole undivided...6.

6. Radula having teeth of the quadrate type. A jaw present. Venation of the lung distinct. Superfamily Holopoda...............................7.

   Radula having teeth of the aculeate or thorn-like type. No jaw in African forms. Superfamily Agnathomorpha...............................8.

7. Shell globose or depressed (in African forms), the columella not truncate, the axis usually shorter than the rather large foot. Central tooth of the radula nearly as wide as the laterals, with a well-developed cusp..Family Helicidæ.

   Shell ovate or turrited, the columella often truncate. Central tooth of the radula narrow with very small cusp (except in *Callistoplepa*). Family Achatinidæ.

   Shell slender, turrited or fusiform, much longer than the short foot. Central tooth of the radula wide...........................Family Clausiliidæ.

8. Shell of clear texture or glassy. Kidney short, transverse. Lung without macroscopic venation other than the pulmonary vein. No jaw. Living animal yellow or red.......................................Family Streptaxidæ.

9. Marginal teeth of the radula short and wide with several short cusps. Sole undivided. Shell heliciform, with simple, sharp lip, more or less opaque and striate or ribbed, generally depressed and umbilicate. .Family Endodontidæ.
Marginal teeth of the radula having long, more or less thorn-shaped cusps (sometimes bifid or trifid). Sole longitudinally tripartite ....10.

10. Visceral mass partly or wholly contained in a spiral shell. .Family Zonitidæ.
Visceral mass contained in the cavity of the foot. Slugs with rudimentary shell wholly or nearly buried in the mantle..............Family Urocyclidæ.

11. Shell ovate or oblong-ovate, thin, pale, of few rapidly increasing whorls, the ovate aperture relatively large ....Family Succineidæ.

12. Shell ovate to cylindric, striate or sculptured, and covered with a cuticle at least partially opaque; usually perforate or rimate......Family Enidæ.
Shell ovate to subcylindric, imperforate, thin and glossy, somewhat transparent, having little or no sculpture................Family Ferussacidæ.

13. Land slugs of oblong shape, without a shell, the ventral surface tripartite. Female orifice at the third to middle of the length, on the right side of the ventral surface. Four tentacles, the upper pair bearing the eyes, contractile. Lung aborted.......................................Family Vaginulidæ.

14. Two uncini, or marginal teeth of the radula, narrow and similar. Sole of the foot not divided by a longitudinal groove............Family Cyclophoridæ.
Outer uncinus or marginal tooth broad, with pectinate edge. Sole having a median longitudinal groove........................Family Pomatiasidæ.

The relations of the several African groups can be more easily seen in the following table:

Families of Land Mollusks Represented in the Belgian Congo

Orders[1]		Suborders		Superfamilies	Families
Pulmonata	Lissopoda	Basommatophora[2]			
		Stylommatophora	Sigmurethra	Holopoda	Helicidæ
					Achatinidæ
					Clausiliidæ
				Agnathomorpha	Streptaxidæ
				Aulacopoda	Zonitidæ
					Urocyclidæ
					Endodontidæ
			Heterurethra[3]		Succineidæ
			Orthurethra		Enidæ
					Ferussacidæ
	Soleolifera	Ditremata		Mesotremata[4]	Vaginulidæ
Pectinibranchiata		Tænioglossa			Cyclophoridæ
					Pomatiasidæ

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[1] If the orders were elevated to subclasses and the suborders to orders, the values would be more closely comparable to the subclasses and orders of Vertebrates.

[2] Congo species of this suborder will be considered in the second paper of this series.

[3] This term is synonymous with Elasmognatha of Mörch, and is used merely for uniformity with the other primary divisions of Stylommatophora.

[4] The Ditremata are divisible into two superfamilies: the Mesotremata, having the female genital orifice submedian and no lung; and the Opisthotremata, having the female orifice posterior and a rudimentary lung (Family Onchidiidæ).

SYSTEMATIC ACCOUNT OF CONGO LAND MOLLUSKS

PULMONATA

Helicidæ

This family, everywhere a dominant group in the northern continents, was long unknown in tropical Africa.[1] The explorations of Stuhlmann, Sjöstedt, the Duke of the Abruzzi and others, and more recently of Robin Kemp, Lang and Chapin, and Bequaert, show that a large and varied fauna of these snails exists in the region of the Great Lakes. They have been found most abundantly in the elevated or mountainous districts of western Uganda and the eastern border of the Belgian Congo.

Helices of the same general appearance have been described from as far west as Kamerun, and east to Mt. Kilimanjaro.[2] They appear to inhabit the mountains of all Equatorial Africa.

The affinities of these tropical African Helices have been in doubt. Wiegmann, von Martens, and Pollonera have considered them *Fruticicolæ*, that is, belonging to the European genus *Hygromia;* but these authors were doubtless influenced by the appearance of the shell, as the soft anatomy has been hitherto only imperfectly described and interpreted.

The structure of the accessory organs of the female genitalia shows that their relationship is with the Oriental Belogona Euadenia, not with the European Belogona Siphonadenia. The dart sacs and branched mucus glands are not cylindric tubes inserted independently of the dart sac or sacs upon the vagina, as in the *Fruticicolæ* and other European genera, but are thin-walled glands, more or less dilated, sometimes only at the ends, and arising from a common base with the dart sacs, as in the genera of eastern Asia.

It is, therefore, to Asia, and not to Europe, that we must look for the allies of these mountain Helices of Central Africa. The Japanese *Trishoplita* and the *Eulotellæ* are specialized in a different way; yet, at present, they are the nearest known, though still quite remote, allies of these African snails.

All of the species are thin-shelled, often fragile or sometimes imperfectly calcified, and perforate or with a small umbilicus. In shape and appearance of the shell, they resemble closely the European species of

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[1] The so-called Helices of South Africa and Madagascar belong to the family Acavidæ, which is not closely related to Helicidæ, and to the Endodontidæ, an Aulacopod group.

[2] See d'Ailly, 1896. Mollusques terrestres et d'eau douce de Kaméroun. Bihang Svenska Vet. Ak. Handl., Stockholm, XXII, 4, No. 2, pp. 1-137, Pls. I-V.

1910, Mollusca, Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro Sjöstedt, I, part 6, pp. 1-34, Pl. I.

Hygromia (*Fruticicola*). Some of the species are pilose or hairy, others smooth-skinned. The lip is thin and either simple or expanded, the columellar margin reflected.

The right ocular retractor passes between the branches of the genitalia.

The reproductive organs are of the belogonous type. The penis bears an unusually thick epiphallus, upon which the retractor muscle is inserted; distally, the retractor inserts upon the diaphragm, as usual. The flagellum is always short. The dart sacs contain no darts and are very small. The mucus glands are slender, and have a common insertion with the dart sacs. The spermatheca has a short duct, and is generally not distinctly differentiated from it.

The jaw is thin, formed of flat, narrow, slightly imbricating vertical laminæ. The teeth and the pallial organs are generally similar to those of most belogonous Helices.

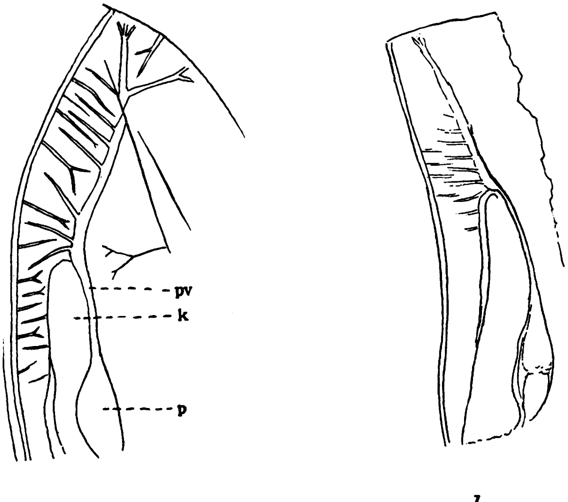

Fig. 1. Pallial organs of *a*, *Halolimnohelix sericata*, new species, and *b*, *H. mollitesta*, new species: k, nephridium (kidney); p, pericardium; pv, pulmonary vein.

The lung (Fig. 1*a*, *b*) resembles that of the belogonous Helices generally. As in others of small size, the venation is not conspicuously developed. The pulmonary vein has no large branches, or only near its end. The pericardium is almost half as long as the kidney. The latter is rather narrow, of the band-like type. Ureter reflexed as usual, the secondary ureter closed in most species examined, but at least half open in *Haplohelix anadenia.*

CLASSIFICATION.—Three divisions of generic rank are indicated by the small number of species which I have dissected. Until a larger number come under the scalpel, it is not apparent what shell characters, if any, are correlated with the anatomical differences.

I. The vagina bears two contiguous dart sacs and variously subdivided mucus glands, all arising from a common base. *Halolimnohelix* Germain.
II. Two widely separated dart sacs, each bearing a divided mucus gland.............................*Vicariihelix*, new genus.
III. No dart sacs or mucus glands..............*Haplohelix*, new genus.

To these groups a fourth may possibly be added for *Helix conradti* v. Martens and *H. bukobæ* v. Martens, which, according to Wiegmann, have a minute sac in the place of the dart apparatus; yet I am by no means satisfied that any of Wiegmann's specimens were mature. There is no certain sign of maturity in the shells, as described and figured by von Martens, both species being described as "mit geradem dünnen Rand" of the aperture. The condition of the genitalia reported by Wiegmann is comparable to that of a young stage of *Halolimnohelix langi*. Wiegmann says that in *H. bukobæ* "dicht vor der Einmündung des Blasenstiels, an der Stelle wo sonst der Pfeilapparat zu sitzen pflegt, befindet sich ein winziges eiförmiges Blindsäckchen von nicht ganz 0.6 mm. Länge, welches wohl als das Rudiment der Gland. mucosæ angesprochen werden kann." And writing of *Helix conradti:* (von Pfeilsack mit Glandulæ mucosæ) "wurde nur an jüngeren Thieren ein Rudiment in Form eines kleinen Blindsackes gefunden."

In order to check Wiegmann's results, I have dissected several immature specimens of *Halolimnohelix langi*, from the original lot taken at Medje. An individual with the shell about 8 mm. in diameter, of 3¾ whorls,[1] is drawn in Fig. 2*a*. The organs are very slender. The dart apparatus is represented by an inconspicuous swelling or low bud on the vagina.

The next stage (Fig. 2*b*), from an individual with shell of about 11 mm. diameter, shows a blind sac on the vagina about 0.8 mm. long, having a lower short, and an upper longer diverticulum. This is clearly the rudiment of the three-fold mucus gland of the adult stage. There are no dart sacs as yet.

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[1] The adult size of *H. langi* is 12.3 to 13.7 mm. in diameter, of 4½ whorls.

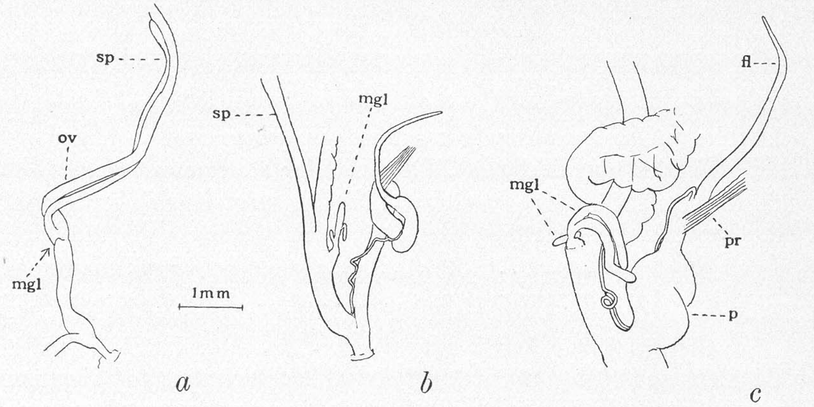

Fig. 2. *a*, *b*, and *c*, Genitalia of immature *Halolimnohelix langi*, new species, in three successive stages of development, all drawn to the same scale: fl, flagellum; mgl, mucus glands; ov, oviduct; p, penis; pr, penial retractor; sp, spermatheca or its duct.

The third stage (Fig. 2*c*) represents the organs in an individual of nearly full growth, in which the lip expansion has not yet begun. Two of the mucus gland branches have attained half their adult length; the third is less than half developed. The dart sacs are represented by only a slight bulging on both sides of the broad base of the whole apparatus. Except for what they are to become, these slight convexities of the base would scarcely be noticed.

The adult size is illustrated in Fig. 11. All the organs are larger, and the dart sacs are developed.

It will be seen that the mucus glands long precede the dart sacs in development. They begin as a single blind sac, which branches later into three. The material at hand does not show the stage between my figures *a* and *b*, yet it can hardly be doubted that that stage would conform exactly to the structure described by Wiegmann for *H. conradti* and *H. bukobæ*. It may safely be assumed, I think, that his preparations were all from immature snails, which would eventually have acquired genitalia such as I have described for *H. langi*, *H. sericata*, and others. Further collections from the type localities of the species in question are needed to convert this assumption into a demonstration.

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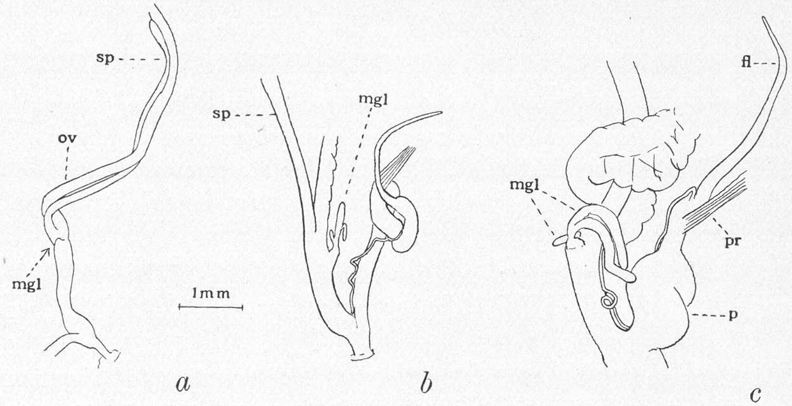

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NOMENCLATURE.—Nearly all of the species described prior to 1913 were placed in *Helix*. In that year Louis Germain proposed the genus *Halolimnohelix*. He did not define the new genus, nor did he attempt to indicate its place in the great series of Helices. He did not nominate a type species, but gave a list of the forms included. At the same time, he proposed a subgenus, *Massaihelix* for *Helix butumbiana* v. Martens.

A few months later in the same year, H. B. Preston proposed several new genera for species of the same general group. He gave definitions which cannot be considered sufficiently diagnostic for genera of Helicidæ—a family in which almost the whole taxonomy rests upon characters of the soft anatomy. These genera he placed in the Zonitidæ! A list of them follows:

Elgonella Preston, 1914, Proc. Zool. Soc. London, p. 795.[1]
Type: *E. eulotæformis* Preston.
Burungaëlla Preston, *op. cit.*, p. 797.
Type: *B. oscitans* Preston.
Blayneyella Preston, *op. cit.*, p. 799.
Type: *B. percivali* Preston.
Larogiella Preston, *op. cit.*, p. 800.
Type: *L. venatoris* Preston.
Nakuruëlla Preston, *op. cit.*, p. 802.
Type: *Zingis bullata* Preston.
Mikenoëlla Preston, *op. cit.*, p. 802.
Type: *M. ahena* Preston.
Urguessella Preston, *op. cit.*, p. 803.
Type: *U. urguessensis* Preston.

Doubtless some of these names will prove to stand for groups of generic or subgeneric rank. All may, for anything I know, though it does not seem plausible. But certainly some other investigator must do the work which the author of a new genus ought to do, before they will have any meaning in the system of Helicidæ. It will probably be best to treat all of these groups as synonyms or subgenera of *Halolimnohelix* until the generic characters of their type species are made known. In proposing a new genus, the burden of proof of its distinctiveness rests with the describer. It is neither good science nor sound ethics for him to pass the hard work on to some one else, meantime encumbering the subject with meaningless names.

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[1] This number of the Proceedings was received at The Academy of Natural Sciences of Philadelphia, November 2, 1914.

My only reason for proposing the new generic terms *Vicariihelix* and *Haplohelix*, in a group already burdened with names, is that otherwise what progress has been made in the taxonomy of these snails would be lost to view. When the types of Preston's genera are dissected and their real generic characters ascertained, it seems likely that some of his genera will prove to be identical with mine, and the necessary substitutions can then be made. At present, the use of his names for the new groups based on anatomical characters would only lead to confusion. The shell characters upon which he depends are such as have but little systematic weight in Helices of other regions, and any attempted correlation of them with the characters of the genitalia would, at the present time, be purely hypothetical.

HALOLIMNOHELIX Germain

Halolimnohelix Germain, 1913, Bull. Mus. Hist. Nat. Paris, No. 6, p. 351.[1]

This genus is characterized by the presence of two equal, closely contiguous dart sacs, without darts, situated high on the vagina, the slender mucus glands inserted between them, all arising from a common base. Other characters are as noticed above for Tropical African Helices generally.

Type: *Helix bukobæ* von Martens.

The Abyssinian group *Lejeania* Ancey has, according to Pollonera,[2] a single dart sac, situated upon the atrium. It is probably related to European genera, as Pollonera claims. The shells are much like some of the Halolimnohelices.

The genitalia show only minor differences in the species examined. The penis is rather short and contains a papilla. Epiphallus stout, the penial retractor inserted at or near its base, and distally on the diaphragm. There is a short flagellum. On the vagina there is a pair of minute, contiguous dart sacs, containing no darts, so far as known, between which, and from their common base, a tripartite mucus gland has its insertion. The primary lobes of this gland may be simple, flattened and club-shaped (Fig. 11) or divided into slender rami (Fig. 8). The spermatheca is very long and narrow, usually fusiform, and but little larger than its duct, which is short.

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[1] This number of the Bulletin was received at The Academy of Natural Sciences of Philadelphia on July 27, 1914.

[2] 1888, Bull. Soc. Malac. Ital., XIII, pp. 75-77, Pl. III.

1. **Halolimnohelix intonsa,** new species

Boga, open grass-land, at about 1000 m.; found dead in a dense growth of *matete* (*Pennisetum benthami*); two specimens, one immature (Bequaert Coll.).

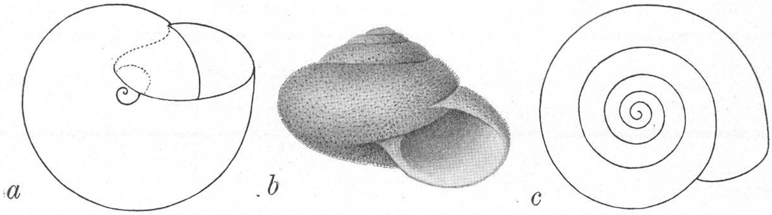

Fig. 3. *a*, *b*, and *c*, *Halolimnohelix intonsa*, new species.

The shell (Fig. 3*a*, *b*, and *c*) is depressed-conoidal, umbilicate, uniform cinnamon-brown, thin. The whorls increase rather slowly at first, the last more rapidly; they are moderately convex. The last whorl is not angular, but being compressed above and below and rapidly curving at the periphery, there is a superficial appearance of obtuse angulation. The surface is dull, covered with quite short, slender, straight hairs, standing in oblique rows, 6 to 8 hairs in one millimeter measured along the rows on the base of the last whorl. Where unbroken, the hairs are about 0.1 mm. long, but most of them are broken shorter. There is no peripheral belt of longer hairs. The last whorl descends in front. The aperture is transversely oval, somewhat lunate. The outer lip is simple; basal lip narrowly expanded, the columellar margin being broadly dilated above, partly covering the narrow umbilicus.

Altitude, 6.8 mm.; diameter, 10.3 mm.; 5 whorls.

The shell is larger than in *H. conradti* von Martens.[1] It differs from *Vicariihelix orthotricha* by the shorter and very much closer hairs. Soft anatomy unknown.

2. **Halolimnohelix rutshuruensis,** new species

Rutshuru, 1200 m., in the forest gallery of the Rutshuru River, in humus under dead leaves; three specimens, one immature (Bequaert Coll.).

The shell (Fig. 4*a*, *b*, and *c*) is depressed, narrowly umbilicate, with very low spire; light brown, thin. The whorls increase slowly at first, the last one rapidly, being double the width of the penult; they are convex, the last rounded peripherally, shortly descending in front. The first half whorl is smooth, faint irregular oblique striæ then beginning. The later whorls have uneven, partly coarse oblique, curved striæ, and low granules more or less distinctly arranged in oblique series. On the base

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[1] 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 127; Derema, German East Africa.

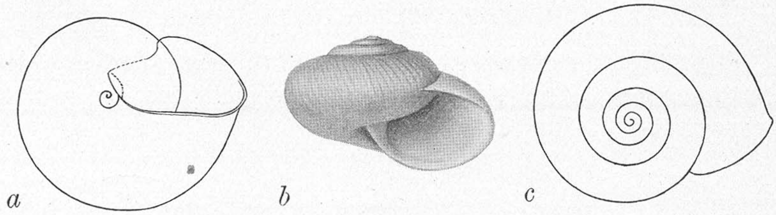

Fig. 4. *a*, *b*, and *c*, *Halolimnohelix rutshuruensis*, new species.

of the last whorl there are about seven granules in one millimeter, measured along the rows. The specimens at hand are "dead" shells, and retain very few hairs on the granules of the penult whorl just above the suture. They are short and slender; doubtless in life the granules bore hairs throughout. The aperture is transversely oval, rather deeply excised by the penult whorl. The peristome is thin but blunt. The outer and basal margins are very narrowly expanded, the columellar margin broadly dilated.

Altitude, 6.5 mm.; diameter, 11.4 mm.; 5 whorls.

This species probably stands near *Urguessella esau* Preston,[1] a smaller, more depressed snail.

3. **Halolimnohelix hirsuta,** new species

Mt. Ruwenzori: western slope, in the Butagu Valley, at about 2200 m., in the lower mountain forest (Bequaert Coll.).

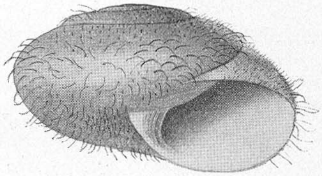

Fig. 5. *Halolimnohelix hirsuta*, new species.

The shell (Fig. 5) is biconvex, bluntly subangular at the periphery, umbilicate, the width of the umbilicus about 1.35 mm., contained about seven times in the total diameter; thin, chestnut-brown. The whorls are moderately convex and increase slowly at first, then rapidly. The surface is somewhat coarsely wrinkled along growth-lines, and bears hairs which are subregularly arranged in advancing and retreating lines. On the upper surface the hairs are short, erect, with long bases; they are about 0.1 to 0.15 mm. long, and stand about 0.2 mm. apart, measured parallel to the suture. In the peripheral region the hairs are about twice as far apart, very long, the longest about 1 mm., curved, triangular toward their bases; on the base they are a little shorter again, but more widely spaced than above. The aperture is transversely shortly oval, but little excised by the penult whorl. The peristome is thin; the basal margin is very little expanded, the columellar margin broadly dilated, impinging on the umbilicus.

Altitude, 5.7 mm.; diameter, 9.2 mm.; width of aperture, 4.8 mm.

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[1] 1914, Proc. Zool. Soc. London, p. 804, Pl. III, fig. 26; Urguess, British East Africa.

This species appears to be closely related to *Urguessella urguessensis* Preston,[1] but in that the spire is "subplanulate" and the hairs are not described or figured as shorter and closer on the upper surface. Moreover, the periphery appears to be more equably rounded than in the present species.

4. **Halolimnohelix mukulensis,** new species

Mukule, between 1800 and 2000 m., in the lower mountain forest (Bequaert Coll.).

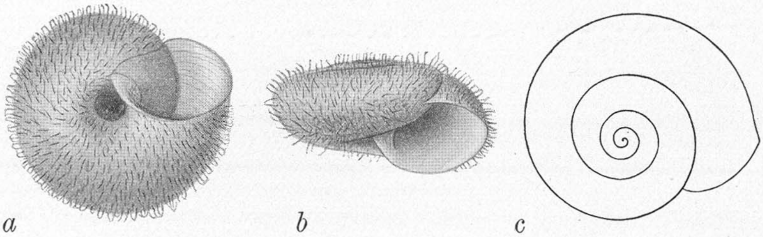

Fig. 6. *a*, *b*, and *c*, *Halolimnohelix mukulensis*, new species.

The shell (Fig. 6*a*, *b*, and *c*) is depressed, the spire nearly flat, umbilicate, dull chamois colored, thin. The whorls increase slowly at first, then rapidly, the last being double the width of the penult. They are moderately convex, the last whorl having an obtusely subangular shoulder and a long rather deep descent to the aperture; the base convex. The surface is dull, covered with delicate, slender, curved hairs in oblique rows. In a band below the suture the hairs are short, over the rest of the last whorl they are from 0.25 to 0.5 mm. long, and they stand about 0.2 mm. apart in the rows. The aperture is very shortly oval, a little excised by the penult whorl; outer and basal margins are simple, the columellar margin broadly dilated. The umbilicus is 1.35 mm. wide, and narrows very slowly inward.

Altitude, 4.3 mm.; diameter, 8 mm.; 4¼ whorls.

This species differs from *Urguessella urguessensis* Preston by its larger umbilicus. *H. hirsuta* has a more elevated spire, a larger umbilicus, and stronger hairs which are flattened basally.

5. **Halolimnohelix sericata,** new species

Ituri Forest: on the banks of the Loia River, between Irumu and Boga, at about 1100 m., type locality, 3 specimens. Kilo, at about 1000

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[1] 1914, Proc. Zool. Soc. London, p. 803, Pl. III, figs. 25, 25*a*, 25*b*; Urguess, British East Africa.

m. Both localities are on the eastern edge of the Rain Forest; the specimens were found alive, crawling in *Helix* fashion over the moist leaves of low bushes, about three feet above the ground (Bequaert Coll.).

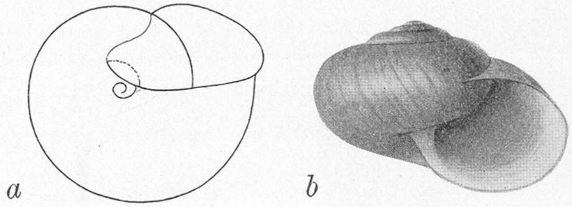

Fig. 7. *a* and *b*, *Halolimnohelix sericata*, new species.

The shell (Fig. 7*a* and *b*) is depressed globose, narrowly umbilicate, very thin, cinnamon-buff, without hairs or hair-scars, matt. The first half whorl is smooth, weak, fine growth-wrinkles then beginning, and on the second whorl these are weakly cut by spiral impressed lines. The later whorls are weakly, obliquely wrinkled or subplicate, the same sculpture continued over the base. Under the microscope some scarcely perceptible traces of spiral striæ may be seen in places, below the suture. The aperture is nearly circular, excised by the penult whorl. The peristome is thin; upper margin straight, outer and basal margins expanded, the columellar margin dilated, partly covering the narrow umbilicus.

Altitude, 10.5 mm.; diameter, 16 mm.; 5 whorls.

The matt surface has a somewhat silky sheen. The thin cuticle is readily detached from the shells, which had been nearly four years in alcohol.

The single adult specimen from Kilo is depressed: altitude, 10 mm.; diameter, 17.5 mm. Possibly another race is indicated. There is also a form from Tongo (between Rutshuru and Mukule, at about 1500 m.; Bequaert Coll.), which appears referable to this or a closely related species, but the specimens are not in sufficiently good condition for diagnosis.

The genitalia (Fig. 8) are characterized by the very long, slender mucus glands, dilated at their distal ends. Two of them are divided, the other simple in the individual figured. The dart sacs are a little less than 1 mm. long. Mounted for examination by transmitted light, no traces of darts were found. The penis is very short and thick, the retractor inserted at its summit. The epiphallus is large; flagellum short as usual. Total length from atrium to end of flagellum, 13 mm. The mucus glands are 9 or 10 mm. long.

The pallial organs are drawn in Fig. 1*a*. The anterior bifurcation of the pulmonary vein, in this individual, is not constant. In another

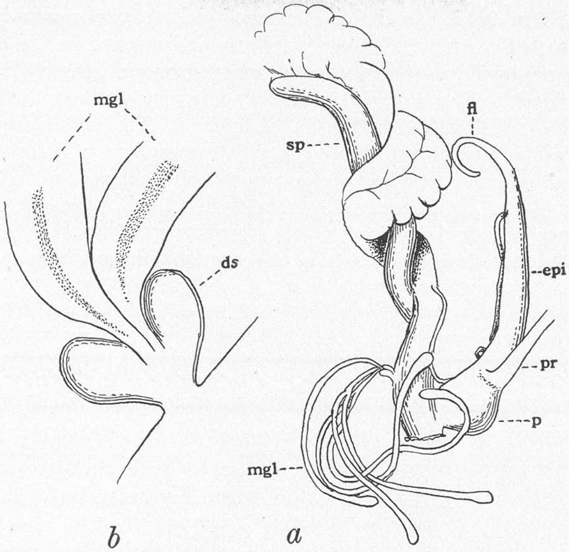

Fig. 8. *Halolimnohelix sericata*, new species. Genitalia (*a*) with a much enlarged detail (*b*) of the dart sacs and bases of the mucus glands: ds, dart sac; epi, epiphallus: fl, flagellum; mgl, mucus glands; p, penis; pr, penial retractor; sp, spermatheca.

specimen, the branch on the cardiac side is much smaller. The venation of the lung is more distinct than in *H. zonata*, but of the same character.

6. **Halolimnohelix langi,** new species

Ituri Forest: Medje, 8 specimens; type locality (Lang and Chapin Coll.).

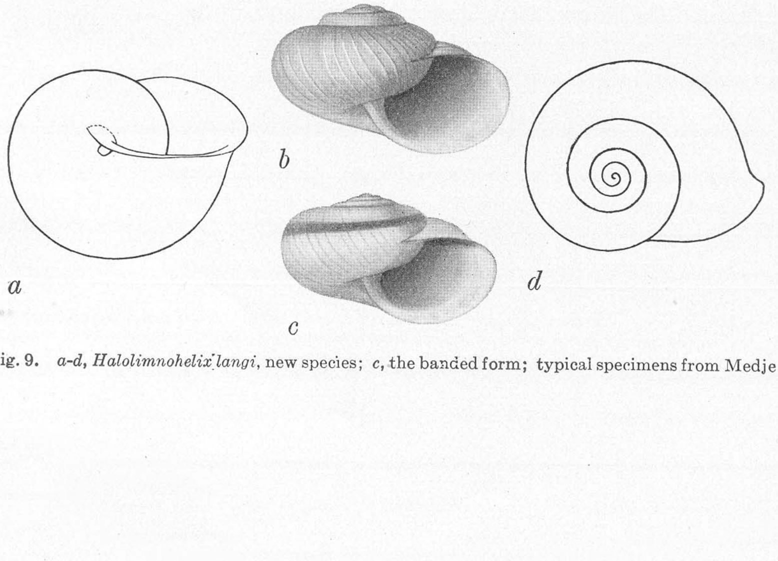

Fig. 9. *a-d, Halolimnohelix langi*, new species; *c*, the banded form; typical specimens from Medje.

The shell (Fig. 9*a*, *b*, *c*, and *d*) is depressed-globose, very narrowly umbilicate, very thin, tawny-olive or isabella color, uniform or having a pale band above the periphery. The spire is low-conoid, the first whorl depressed, the tip slightly turned in. Whorls convex, at first slowly, then rapidly enlarging, the last more than double the width of the preceding, slowly descending in front. The surface is matt, the last two whorls weakly, irregularly plicate, or with coarse, low, oblique wrinkles, also conspicuous on the base. The aperture is transversely oval, only a small part excised by the penult whorl. The peristome is thin, flesh-colored, expanded, basal margin reflected, columellar margin dilated, partly over the umbilicus.

Altitude, 8 mm.; diameter, 13.7 mm.; 4½ whorls (type specimen).
Altitude, 7.5 mm.; diameter, 12.3 mm.; 4½ whorls (topotype).

One immature specimen is chestnut-brown, fading to isabella color near the suture and in the middle of the base, and having a pale band above the periphery. Some others have an approach to this color, having the ground a little darker on both sides of the supraperipheral pale band. This coloration is ascribed to *Helix bukobæ* v. Martens,[1] from Bukoba on the western shore of Victoria Nyanza, but that species is described and figured as "etwas breit genabelt," while the Medje shell has a very narrow umbilicus. *Natalina permembranacea* Preston[2] is a much more depressed species, but evidently related.

A single specimen (Fig. 9*c*), also from Medje, has a chestnut-brown supraperipheral band. The shell is also more solid, having a thicker calcareous layer, though the specimen was preserved in alcohol while the others were dry. Altitude, 7.3 mm.; diameter, 11.9 mm.

A specimen from Walikale (Bequaert Coll.) differs by having decidedly stronger oblique folds (Fig. 10).

One shell from Rutshuru (Bequaert Coll.), while a little larger than typical *langi*, and rather more emphatically sculptured, does not appear to differ specifically. I cannot match it with any of Preston's species from adjacent localities.

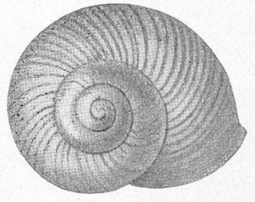

Fig. 10. *Halolimnohelix langi*, new species; form from Walikale.

The genitalia (Fig. 11*a* and *b*) are characterized by the relatively short and undivided lobes of the mucus gland. They are a little longer and unequal in the banded individual. The penis contains a short

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[1] 1895, Nachrichtsbl. D.Malak. Ges., XXVII, p. 179; 1897, Deutsch Ost Afrika, IV, Beschalte Weichth., p. 58, Pl. III, fig. 23.

[2] 1912, Proc. Zool. Soc. London, p. 183, Pl. XXXI, figs. 20 and 20*a-b*; Kigezi, extreme S. W. Uganda.

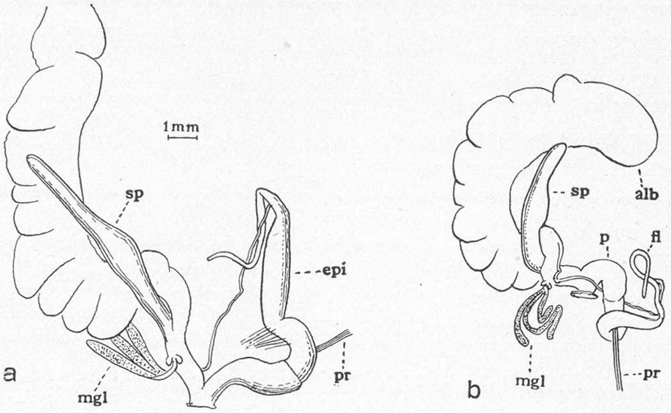

Fig. 11. *Halolimnohelix langi*, new species. Genitalia from two adult individuals. *a*, typical; *b*, having a chestnut band: alb, albumen gland; epi, epiphallus; fl, flagellum; mgl, mucus glands; pr, retractor of the penis; p, penis; sp, spermatheca.

cylindric papilla, 1.5 mm. long, and perforate at the end. The fusiform spermatheca together with the duct is about 8 mm. long.

The genitalia in immature stages are illustrated in Fig. 2*a*, *b*, and *c*.

7. **Halolimnohelix zonata,** new species

Mt. Ruwenzori; western slope, in the Lanuri Valley, at about 3000 m. in the bamboo forest (Bequaert Coll.).

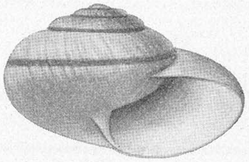

Fig. 12. *Halolimnohelix zonata*, new species.

The shell (Fig. 12) is depressed-globose, very narrowly umbilicate, extremely thin, being mainly cuticular, tawny-olive, with a chestnut-brown band above the periphery. The spire is low conic. The whorls increase rather slowly at first, then rapidly, the last one being over double the width of the penult. The surface is rather glossy on the spire, the last whorl dull; sculpture of coarse low folds or waves, not very oblique, and somewhat weaker on the base. The columellar margin of the peristome is dilated as usual, the other margins appearing to be simple, but the outer and basal borders are membranous and shrink in drying.

Altitude, 9 mm.; diameter, 13.5 mm.; 5 whorls.

The last whorl is much wider than in *H. ruwenzoriensis*. The spire is higher and its whorls more coarsely plicate than in *H. langi*. The shell appears also to be even thinner than that species, and in shells of about the same diameter there is a half whorl more. The last whorl appears to be more depressed than in *Blayneyella kisengiensis* Preston,[1] from Kisenje, Lake Kivu.

Genitalia (Fig. 13). The epiphallus is particularly stout. The mucus glands are very long and slender, as in *H. sericata*. The penial retractor was not seen. The vagina is longer, the spermatheca shorter than in *sericata*. Length of penis, epiphallus, and flagellum, 13 mm.; length of longest mucus gland, 6 mm.

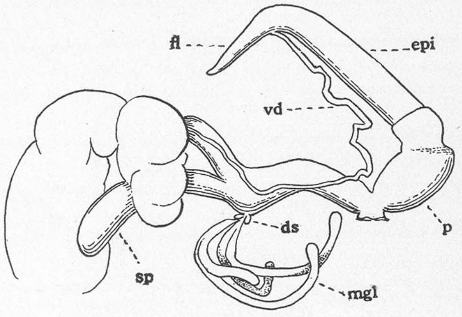

Fig. 13. Genitalia of *Halolimnohelix zonata*, new species: ds, dart sac; epi, epiphallus; fl, flagellum; mgl, mucus glands; p, penis; sp, spermatheca; vd, vas deferens.

The central tooth of the radula (Fig. 14) has no side cusps; mesocone shorter than the basal plate. The laterals are all bicuspid. The marginal teeth have very short, wide basal plates. Mesocone broad, quite long, and simple. The ectocone is bifid on part of the teeth.

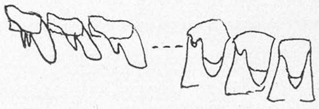

Fig. 14. Teeth of *Halolimnohelix zonata*, new species. A central tooth with two adjacent laterals and group of marginals.

8. **Halolimnohelix mollitesta,** new species

Mt. Ruwenzori: western slope, in the Lanuri Valley, at about 1900 m. (Bequaert Coll.).

The shell is narrowly umbilicate, depressed, dull, resembling *H. zonata* closely in color and surface; also in shape, except that the last whorl is somewhat narrower. The lip is narrowly expanded. The shell is so thin that it is a good deal indented

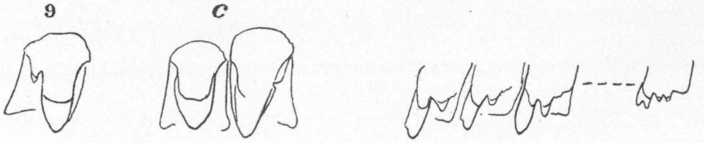

Fig. 15. *Halolimnohelix mollitesta*, new species. Teeth.

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[1] 1914, Proc. Zool. Soc. London, p. 799, Pl. I, fig. 21.

and variously deformed in the alcoholic samples, which have scarcely any calcareous layer. It cannot be removed from the hardened animal, but one dried with the soft parts partly contained measures 10.5 mm. in diameter, 6.5 mm. in altitude.

The radula has 22-9-1-8-22 teeth (Fig. 15). They are decidedly larger than in *H. zonata,* though the shell is smaller. The inner laterals have only a very narrow ectocone, which has no base separate from the mesocone. On the outer laterals a distinct ectocone appears. The number of lateral teeth is not much more than half as great as in *H. zonata.* The marginal teeth differ notably from those of *H. zonata* in shape of the basal plates and the less oblique cusps. The inner ones have the mesocone weakly bifid. The figures of teeth of *mollitesta* and *zonata* are drawn to the same scale.

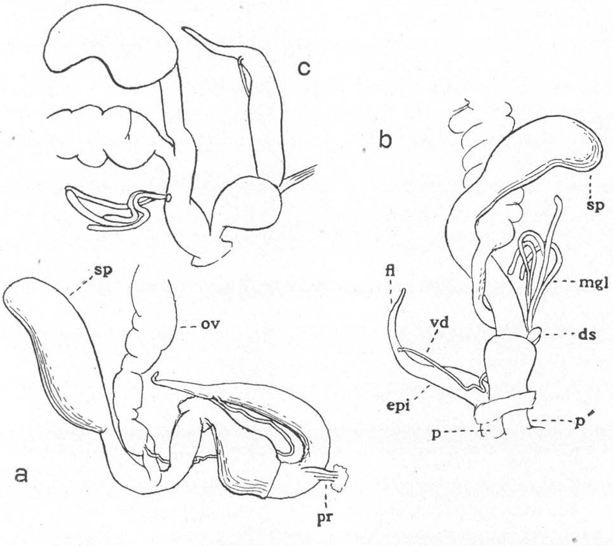

Fig. 16. *a, b,* and *c, Halolimnohelix mollitesta,* new species. Genitalia of three individuals. *a,* type specimen; the mucus glands, mutilated in preparation, are not drawn. *b,* one of a pair taken in copulation: ds, dart sac; epi, epiphallus; fl, flagellum; mgl, mucus glands; ov, oviduct; p, penis, the greater part of which enters the second individual; p′, penis of the second individual entering the vagina of the first; sp, spermatheca; vd, vas deferens.

The male organs (Fig. 16*a, b,* and *c*) resemble those of *H. zonata;* also the mucus glands, of which there are four, uniting below into two. The dart sacs are somewhat larger. The spermatheca is oblong and much larger, or possibly in a more distended state, than in any other species of the genus examined.

In copulation both individuals act male and female parts at the same time. Fig. 16*b* shows the genitalia of one individual with its penis inserted in the vagina of another, the penis of which it is also receiving.

The pallial organs are drawn in Fig. 1*b*. Length of lung, 12 mm.; length of kidney, 7.5 mm.; length of pericardium, 3.5 mm.

9. **Halolimnohelix ruwenzoriensis** (Smith)

Trachycystis ruwenzoriensis E. A. Smith, 1909, Trans. Zool. Soc. London, XIX, p. 44, Pl. I, figs. 9-11. Type locality: Mobuku Valley, eastern slope of Mt. Ruwenzori, 10,000-14,000 ft.

Mt. Ruwenzori: western slope in the Butagu Valley, at about 3500 m. Abundant in the upper alpine zone, in the wet moss of the swampy *Erica*-formation (Bequaert Coll.).

A series of specimens from high on Mt. Ruwenzori agree better with this than with any other described form. The shell is partially decalcified, quite soft in the alcoholic specimens, more or less shrivelled in those removed from spirit and dried. According to Bequaert, it is soft in life and cannot be picked up without indenting. It is decidedly more depressed than *Haplohelix anadenia*.

10. **Halolimnohelix bulla,** new species

Mokoto, between Rutshuru and Masisi, at about 2000 m., in the lower mountain forest; 1 specimen (Bequaert Coll.).

The shell (Fig. 17) is obliquely perforate, subglobular, with shortly conic spire, extremely thin and fragile, honey-yellow, having but little gloss except in front of the aperture. The first whorl is smooth, the following irregularly striate obliquely; last whorl irregularly plicate, the folds somewhat weaker on the base. The last whorl descends slowly but rather deeply in front and is strongly convex at the base. The aperture is large, oblique; the peristome is thin, the outer and basal margins unexpanded, the columellar margin triangularly dilated above, nearly covering the narrow umbilicus.

Altitude, 14 mm.; diameter, 15.8 mm.; length of aperture, 9.8 mm.; width, 8.5 mm.; 5½ whorls.

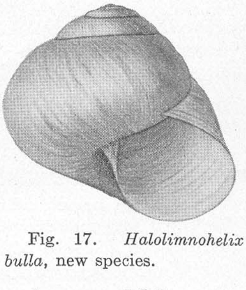

Fig. 17. *Halolimnohelix bulla*, new species.

This species appears to belong to the genus or subgenus *Mikenoëlla* Preston. It is more elevated than *M. ahena* Preston,[1] judging by the figures, and has a decidedly smaller perforation. *Zingis gregorii* E. A. Smith,[1] is somewhat less elevated and, from Smith's description, appears to be smoother—"*lineis incrementi obliquis tenuibus sculpti.*"

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[1] 1914, Proc. Zool. Soc. London, p. 802, Pl. II, figs. 20*a-c*.

VICARIIHELIX, new genus

Belogona Euadenia having two minute flask-shaped dart sacs, without darts, widely separated on the vagina, each provided with a mucus gland divided into two slender branches (Fig. 18). Other organs as in *Halolimnohelix*. Shell *Hygromia*-like, thin, with simple peristome (the type species hirsute).

Type: *V. orthotricha*, new species.

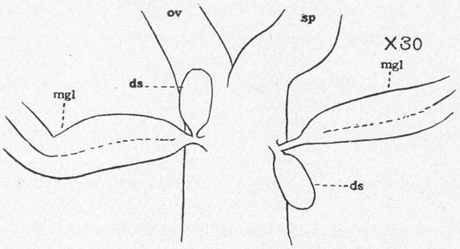

Fig. 18. Part of the vagina of *Vicariihelix orthotricha*, new species, showing the separated dart sacs (ds) and bases of the mucus glands (mgl): ov, oviduct; sp. spermatheca.

This group may be identical with *Urguessella* Preston, which contains hairy species; yet, according to Wiegmann, *Helix conradti* v. Martens, also hairy, has another type of vaginal accessory organs; so that it is uncertain which type of genitalia *Urguessella* has.

Probably the small size of the teeth, and the different shapes of centrals and laterals may prove to be additional generic characters.

11. **Vicariihelix orthotricha**, new species

Mt. Ruwenzori: western slope, in the Butagu Valley at about 3500 m. (Bequaert Coll.).

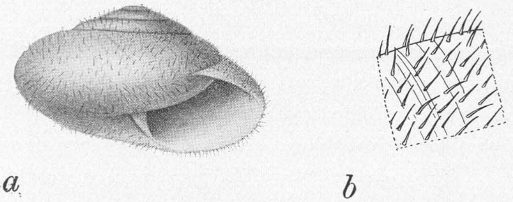

Fig. 19. *a* and *b*. *Vicariihelix orthotricha*, new species. At *b*, a square millimeter enlarged to show hairs at and below the periphery.

The shell (Fig. 19*a*) is depressed, thin, cinnamon-brown, umbilicate, closely pilose. The hairs are quite short on the upper surface, where they stand about 0.15 mm. apart on the last whorl, but there are some long straight ones, up to 0.5 mm. in length, just above the sutures where they are protected from abrasion, and in the peripheral region of the latter part of the last whorl, where they average 0.2 to 0.3 mm. long (Fig. 19*b*). The hairs are slender, not triangularly widened basally, as in *Halolimnohelix hirsuta*. The umbilicus is nearly 1 mm. wide. The aperture is lunate. The lip is thin, simple, dilated triangularly at the columellar insertion.

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[1] 1895, Proc. Malac. Soc. London, I, p. 164; fig. 4 (on p. 166).

Altitude, 6.3 mm.; diameter, 8.7 mm.; 5 whorls.

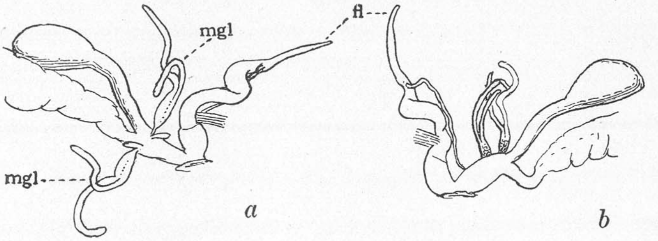

Fig. 20. *Vicariihelix orthotricha*, new species. Genitalia of the same specimen: upper (*a*) and lower (*b*) views: fl, flagellum; mgl, mucus glands.

The genitalia are drawn in Fig. 20*a* and *b*. The penis is short; epiphallus stout, with penial retractor inserted close to the base. The dart sacs are flask-shaped. The two branches of each mucus gland are closely united for nearly one-third of their length. The spermatheca is oblong, nearly as long as its duct.

Length of penis and epiphallus, 5 mm.; of flagellum, 3 mm.; length of spermatheca and duct, 6 mm.; length of dart sacs, 0.3 mm.

The jaw is very thin, formed of slightly imbricating, flat, vertical plates.

The radula has very small teeth (Fig. 21). The central has well-developed ectocones, and a much narrower mesocone than in *Halolimnohelix*. It is also shorter. Lateral teeth are similar in shape, but lack entocones. The inner marginals have the mesocone and ectocone simple; farther out, both are bifid; the outermost have two or three cusps. There are about fifteen lateral teeth.

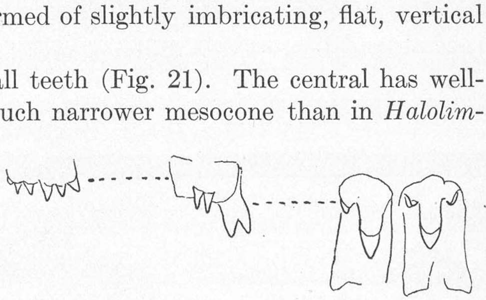

Fig. 21. Teeth of *Vicariihelix orthotricha*, new species.

Helix conradti v. Martens is not described or figured in sufficient detail to permit a critical comparison, especially as to the pilosity; yet the expression "mit kurzen, krummen Härchen besät," does not accord well with the Ruwenzori shell, in which the hairs are straight and partly rather long. The spire of *H. conradti* is represented as higher, and the umbilicus smaller.

HAPLOHELIX, new genus

The shell is *Hygromia*-like, very thin, not hairy so far as known. Genitalia: male organs substantially as in *Halolimnohelix;* female side without dart apparatus or other accessory organs; the oval spermatheca is not well differentiated from its duct.

Type: *H. anadenia*, new species.

While the genitalia are technically epiphallogonous, yet the lung, shell, etc., show that this group is related to *Halolimnohelix*, from which it diverged, presumably, by degeneration of the dart apparatus.

The shell in this group, as in *Halolimnohelix zonata* and *H. mollitesta*, has the characters of Preston's genus *Larogiella;* but the generic characters of that group are not known.

Helix karewia v. Martens apparently belongs to this genus.

12. **Haplohelix anadenia**, new species

Mt. Ruwenzori: western slope, in the Butagu Valley, at about 3500 m. (Bequaert Coll.).

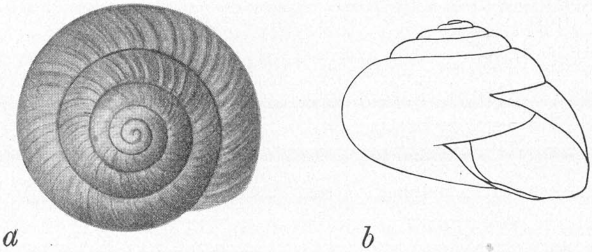

Fig. 22. *a* and *b*, *Haplohelix anadenia*, new species, from a dry shell.

The shell (Fig. 22*a* and *b*) is narrowly umbilicate, fragile, ochraceous tawny in general color when dry, but in some lights appearing yellower or browner; composed of 5 rather convex whorls, the first 1½ smooth, the rest, and especially the last two, having obliquely radial, curved, low folds; not calcified near the aperture. The spire is rather well elevated, of closely coiled whorls, the last well rounded. The aperture is lunate, irregular by distortion of the thin shell. Columellar margin rather broadly dilated partly over the umbilicus, the peristome elsewhere thin and not expanded.

Altitude, about 8 mm.; diameter, 11.5 mm.

A specimen in alcohol (Fig. 23*a* and *b*) has the inner whorls pale pinkish buff (having lost the cuticle), the last two honey-yellow with irregular dark gray maculation, showing through from the mantle.

The lung is 11 mm. long, maculate with dark gray; kidney 6 mm. long; pericardium 3 mm. long. These organs are as figured for *Halo-*

limnohelix mollitesta. The secondary ureter is open for half its length. The right eye is retracted between male and female branches of the genitalia as usual.

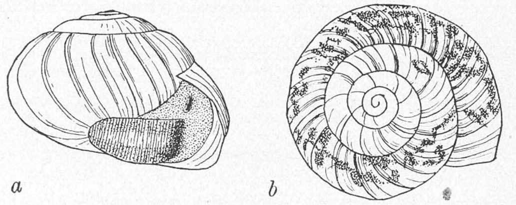

Fig. 23. *a* and *b*, *Haplohelix anadenia*, new species, alcoholic specimen; in *b*, the color pattern of the mantle showing through.

The genitalia (Fig. 24) differ from all other species of the region yet dissected by the writer by wanting dart sacs and mucus glands. The vagina is short relative to other species. Male organs peculiar, the epiphallus very large, flagellum shorter than in other species of the region. The spermatheca is oval on a rather long duct, much longer than itself. Other characters are sufficiently shown in the figure.

Length of penis and epiphallus, 5 mm.; length of flagellum, 1 mm.; length of vagina, 2.3 mm.; length of spermatheca and duct, 9 mm.

The shell of this species is decidedly less depressed than in *Halolimnohelix ruwenzoriensis* (Smith), and does not have the band of *H. zonata*. The absence of any vestige of accessory organs on the vagina, and the shorter flagellum, differentiate it from all other species of the region except *Helix karewia* v. Martens, in which Wiegmann found no vestiges of a dart apparatus. *H. karewia*, with the same number of whorls as the present species, has a much larger shell, 17 mm. in diameter, but no other difference is apparent. Further investigation may show that *H. anadenia* is merely a small form of *H. karewia*.

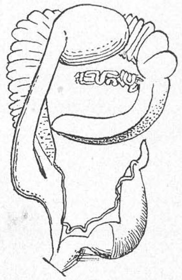

Fig. 24. *Haplohelix anadenia*, new species. Genitalia.

Other Helicidæ Recorded from the Belgian Congo

All of the following appear to belong to *Halolimnohelix* and related genera. In the present stage of our knowledge the genera are not determinable by the shell alone, and as I do not care to add uncertain combinations to swell synonymy, the species are left under the original genera. Probably all should be referred to *Halolimnohelix* until they are shown to differ generically.

Helix conradti v. Martens

Helix conradti E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 179 (type locality: Derema in Usambara); 1897, Deutsch Ost Afrika, IV, Beschalte Weichth., p. 56, Pl. III, fig. 20.

Fruticicola conradti v. Martens. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 200.

Halolimnohelix conradti v. Martens. GERMAIN, 1913, Bull. Mus. Hist. Nat. Paris, p. 351.

Semliki Valley: at the western foot of Mt. Ruwenzori (Schubotz Coll.).

Helix karewia v. Martens

Helix karewia E. v. MARTENS, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 175.

Helix karevia E. v. MARTENS, 1897, Deutsch Ost Afrika, IV, Beschalte Weichth., p. 55, Pl. III, fig. 18.

Fruticicola karevia v. Martens. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 200.

Halolimnohelix karevia v. Martens. GERMAIN, 1913, Bull. Mus. Hist. Nat. Paris, p. 351.

Mt. Ruwenzori: Karevia, western foot of the mountain, at about 1200 m. (type locality); also in the bamboo forest, at 2600 m. and at Stuhlmann's camp IV, at 3600 m.; both the last named localities in the Butagu Valley (Stuhlmann Coll.). Western foot of Mt. Ruwenzori (Schubotz Coll.).

Helix runssorina v. Martens

Helix runssorina E. v. MARTENS, 1895, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 127; 1897, Deutsch Ost Afrika, IV, Beschalte Weichth., p. 57, Pl. III, fig. 21.

Fruticicola runssorina v. Martens. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 200.

Halolimnohelix runssorina v. Martens. GERMAIN, 1913, Bull. Mus. Hist. Nat. Paris, p. 351.

Mt. Ruwenzori: Butagu Valley, western slope, in an alpine swamp between moss, at 3000 m. (type locality); also in camp III, at 3100 m. (Stuhlmann Coll.). Mt. Karisimbi, at 3300 m. (Schubotz Coll.). Germain records this species from Mt. Kilimanjaro, at 1500 m., but the identification seems uncertain.

Zingis gregorii Smith

Zingis gregorii E. A. SMITH, 1895, Proc. Malac. Soc. London, I, p. 164; fig. 4 (on p. 166) (type locality: Mt. Kenia, lowest forest zone). E. v. MARTENS, 1897, Deutsch Ost Afrika, IV, Beschalte Weichth., p. 53.

Mt. Ruwenzori: Butagu Valley, western slope in the bamboo forest, at 2600 m. (Stuhlmann Coll.).

Zingis bequaerti Dautzenberg and Germain

Zingis bequaerti DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 18, Pl. I, figs. 5-7.

Type locality: Kundulungu Plateau, between Kilwa and Sampwe, at about 1800 m. (Bequaert Coll.).

Burungaëlla oscitans Preston

Burungaëlla oscitans Preston, 1914, Proc. Zool. Soc. London, p. 797, Pl. i, figs. 17*a-c*.

Type locality: Burunga at the foot of Mt. Mikeno, 2000 m. (Kemp Coll.).

Burungaëlla imperforata Preston

Burungaëlla imperforata Preston, 1914, Proc. Zool. Soc. London, p. 798, Pl. i, fig. 15.

Type locality: Burunga at the foot of Mt. Mikeno, 2000 m. (Kemp Coll.).

Burungaëlla buhambaënsis Preston

Burungaëlla buhambaënsis Preston, 1914, Proc. Zool. Soc. London, p. 798, Pl. i, fig. 16.

Type locality: Buhamba, between Burunga and Lake Kivu, at about 1700 m. (Kemp Coll.).

Nakuruëlla soror Preston

Nakuruëlla soror Preston, 1914, Proc. Zool. Soc. London, p. 802, Pl. i, figs. 13*a-c*.

Type locality: Burunga at the foot of Mt. Mikeno, 2000 m. (Kemp Coll.).

Mikenoëlla ahena Preston

Mikenoëlla ahena Preston, 1914, Proc. Zool. Soc. London, p. 802, Pl. ii, figs. 26*a-c*.

Type locality: Burunga at the foot of Mt. Mikeno, 2000 m. (Kemp Coll.).

Urguessella capillata Preston

Urguessella capillata Preston, 1914, Proc. Zool. Soc. London, p. 804, Pl. iii, fig. 28.

Type locality: Burunga at the foot of Mt. Mikeno, 2000 m. (Kemp Coll.).

The following species have been found on or close to the boundary of the Belgian Congo, so that they may be expected within its limits:

Helix butumbiana E. v. Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 179; 1897, Deutsch Ost Afrika, IV, Beschalte Weichth., p. 58, Pl. iii, fig. 22. Type locality: Migere in Butumbi (Stuhlmann Coll.). Germain, 1913, Bull. Mus. Hist. Nat. Paris, p. 352, has made this the type of his subgenus *Massaihelix*, "nom rappelant la steppe des Massai où vit l'espèce type." *Helix butumbiana* has never been recorded except from Butumbi, on the southwestern shore of Lake Albert Edward, about 600 miles west of the Masai steppe.

Fruticicola bujungolensis Pollonera, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 561, p. 2; 1909, Il Ruwenzori, Parte Scientif., I, p. 195, Pl. xx, fig. 7. Type locality: Bojongolo on the eastern slope of Mt. Ruwenzori in the Mobuku Valley, at 3500–4000 m.

Fruticicola bihungæ Pollonera, 1907, Boll. Mus. Anat. Comp. Torino, XXII, No. 561, p. 2; 1909, Il Ruwenzori, Parte Scientif., I, p. 195, Pl. xx, figs. 15 and 16. Type locality: Bihunga on the eastern slope of Mt. Ruwenzori in the Mobuku Valley at about 2000 m.

Larogiella fonticula Preston, 1914, Proc. Zool. Soc. London, p. 801, Pl. ii, fig. 3. Type locality: Lake Mutanda (extreme S. W. Uganda).

Burungaëlla mutandana Preston, 1914, Proc. Zool. Soc. London, p. 798, Pl. i, fig. 14. Type locality: Lake Mutanda (extreme S. W. Uganda).

Natalina permembranacea PRESTON, 1912, Proc. Zool. Soc. London, p. 183, Pl. XXXI, figs. 20 and 20*a-b*. Type locality: Kigezi, at 2000 m. (extreme S. W. Uganda).

Zingis kempi PRESTON, 1912, Proc. Zool. Soc. London, p. 185, Pl. XXXII, fig. 14. Type locality: between Mbarara and Kigezi (extreme S. W. Uganda).

Zingis papyracea PRESTON, 1912, Proc. Zool. Soc. London, p. 185, Pl. XXXII, fig. 15. Type locality: Kigezi, at 2000 m. (extreme S. W. Uganda).

Blayneyella kisengiensis PRESTON, 1914, Proc. Zool. Soc. London, p. 799, Pl. I, fig. 21. Type locality: Kisenje on Lake Kivu, at 1500 m. (German East Africa).

O. Bœttger, 1885, 24. u. 25. Jahresber. Offenbacher Ver. Naturk., p. 187, has reported the European *Helix* (*Helicogena*) *aspersa* Müller from Banana, only dead and strongly bleached shells found in sand near the Dutch store; these shells were probably imported dead with ballast or merchandise.

Achatinidæ

In the Manual of Conchology, this family is defined as follows. Holopod, sigmurethrous snails, with the central tooth of the radula as a rule very narrow (except in *Callistoplepa*), its cusp small or absent, the side teeth tricuspid or bicuspid. Jaw generally striated. Genitalia with no accessory organs. Kidney two or three times the length of the pericardium. Pulmonary vein without large branches. Shell ovate, turrited, or cylindric, well developed and capable of containing the entire soft parts; the columella frequently truncated below. No heliciform or slug-like types are known up to this time.

This is a tropical family, most of the genera being confined to Africa and Middle America. They are very abundant in tropical Africa, being the only terrestrial mollusks which can be said to be conspicuous there by their size as well as by the large number of individuals.

The Achatinidæ have been provisionally divided into three subfamilies: the Achatininæ are at the present time found in a native state only in the Ethiopian Region including Madagascar and the neighboring islands; the Stenogyrinæ occur in the tropics of both hemispheres; the third, Cœliaxinæ, contains a few monotypic genera from San Thomé, the southeastern Cape Colony, and Cuba.

Both the Achatininæ and Stenogyrinæ are abundantly represented in the collection at hand. No Cœliaxinæ have, as yet, been found in the Congo Basin or in the region of the Great Lakes.

Achatininæ

Mostly capacious shells, ovate, turrited, or rarely subcylindric, often decorated with zigzag stripes; whorls without internal lamellæ and coiled around a slender axis, which is solid or nearly so.

Whether the few species of *Achatina* occurring on Fernando Po, the Comoros, and Madagascar are indigenous or imported by man is undetermined but, since they are used as food, importation appears probable. In the Seychelles, Mauritius, etc., there can be little doubt of importation. Otherwise the Achatininæ are restricted to continental Africa.

Key to Genera of the Congo Basin

1. Columella distinctly truncate at the base. Shell ovate or rarely oblong, with conic spire and small apex. Two or three earliest whorls smooth, forming a trochiform nucleus, obtuse at the apex............................2.
   Columella quite weakly or not at all truncate............................3.

2. Shell varying from moderately strong to very solid. Middle tooth of the radula narrow............................*Achatina* Lamarck.
   Shell thin, very closely and deeply striate. Middle tooth of the radula wide. *Callistoplepa* Ancey.

3. Early whorls forming a nipple-like summit. Columella often weakly truncate..4.
   Summit conic or obtuse and rounded, not nipple-like......................5.

4. Imperforate............................*Pseudotrochus* H. and A. Adams.
   Perforate............................*Perideriopsis* Putzeys.

5. Shell broadly ovate, capacious, the length of aperture more than half that of the shell. Cuticle streaked along lines of growth, but without oblique or zigzag markings. Peristome of some pinkish hue............*Burtoa* Bourguignat.
   Shell oblong or turrited, the length of aperture less than half that of the shell; unicolored or with oblique bands or zigzag stripes. Peristome whitish.....6.

6. Sculpture beginning on the first whorl (when unworn), the later whorls closely granular. Shell oblong-ovate, with very obtuse summit. Reproducing by few, large eggs............................*Limicolariopsis* d'Ailly.
   First whorl without granulation, the sculpture beginning later; sometimes the shell nearly smooth............................7.

7. Columella obsoletely truncate, vertical or nearly straight; its edge reflexed, but not closing the umbilical fissure. Axis perforate. Outer lip simple, more or less thickened within............................*Perideriopsis* Putzeys.
   Columella continuous with the basal margin, its edge reflexed above. Outer lip thin, simple, and acute............................*Limicolaria* Schumacher.

"The large land snails (*Achatina*) of the Congo Basin are rarely found in the uninhabited stretches of the Equatorial Rain Forest, although an abundance of moisture and decaying vegetable matter apparently offer throughout the year ideal conditions for snail life. They are far more numerous on native plantations, especially in plantain gardens and secondary growth, and generally in the neighborhood of the many villages scattered like a thousand sunny islets in the immense West African forest area. After heavy rains they crawl on the ground, or sometimes as high as six feet on the stems of plantains and nearby forest trees, to which they often affix themselves in shady places by means of an excretion that forms a whitish pellicle. Every interstice between aperture and support is then closed, perhaps their best protection against the attacks of insects and other enemies. When poked they drop helplessly to the ground, with foot still drawn back, but the shell is seldom broken by the fall.

"Outside the forest belt, in the open plains, these large snails are scarcer and are greatly affected by alternating periods of rain and drought. During the dry season, which may last four months or more (from December to March) in the Uele, the newcomer might believe them to be completely absent, for at that time they estivate several inches below the surface, their aperture closed by a strong epiphragm some distance in from the edge of the shell.[1] Before the cessation of the last heavy rains the vegetation has become rather tough and the soft soil then offers no great resistance to the burrowing snails. The Mangbetu claim that at that time the *Achatinæ* are fattest, and as long as traces of their hiding places can be detected easily the natives collect them in numbers as one of the season's delicacies. Snails thus imbedded in the ground escape the danger of destruction by annual grass fires, and one searches the scorched fields in vain for large shells; only a few fragments and an occasional bleached shell testify to their occurrence in these regions. With the first rains an abundant tender vegetation springs up and the snails awaken to active life. At a certain time, as the rainy season continues, enormous numbers of young and relatively few adults may be seen climbing the vegetation, especially plantains. Near the villages many of these young *Achatinæ* are eaten by the numerous chickens kept by the natives before the snails can arrive at a point beyond their reach and, in the forest regions, half-grown snails form the principal food of monitors (*Varanus niloticus* Linné).

"After many years of experience in the Congo, one comes to the conclusion that the *Achatinæ*, *Limicolariæ*, and certain other land-snails have often spread over great districts through the agency of man, a factor worthy of consideration in a study of the variability of such species. Plantains, especially, must have considerably aided their dissemination, for various parts of this plant are carried for miles from village to village; its leaves are used for wrapping food and packages, and, when dried and properly arranged, form the soft mattress of nearly every native bed; its trunk serves as a temporary footstool and pillow; the fruit bunches are taken to the markets; and, finally, its young shoots are transported from old plantations to new clearings, often to a considerable distance. Among other possible carriers of young snails and eggs, one may mention the enormous quantities of weeds and refuse, often thrown into water-courses near the villages, and held up for hours or days at various points along the shore by outstanding branches and roots, fallen trees, and creepers.

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[1] E. A. Smith (1899, Proc. Malacol. Soc. London, III, p. 309, fig. 1) also remarks that the epiphragm of *A. immaculata* "withdraws a little way back from the extreme edge at the lower, or anterior, end. This is necessary in order to allow a notch or sinus on the inner edge to fit under the columella."

"In all regions we visited in the Belgian Congo these snails (*Achatinæ*) at times furnish a welcome addition to the food supply of most tribes, and in the Uele are served occasionally at the tables of Europeans. The native method of preparation is to throw them alive into a pot of water, tightly covered with green banana leaves, boiling them for some time. They usually let them stand in the water until cool, when they throw them on green banana leaves spread on the ground. With a splinter of raphia or bone they readily remove the snails from the shells, and eat them after careful cleaning. Very often they are cut to pieces, well seasoned, stewed in oil and served as a relish.

"The empty shells of the large *Achatinæ* are seen lying on refuse heaps and along the rivers, mixed with those of the large fresh-water mollusks; but many are broken and not fit for collections.

"Outside the forest, calabashes of all sizes and shapes furnish necessary vessels and other utensils for the natives, while in the forest these large shells are utilized in various ways, especially as containers for the preservation of the much coveted salt, which in the moist climate becomes a liquid. During meals the shell rests in a hollow in the ground, and the natives dip their finger tips in the precious fluid from time to time. A large abnormal *Achatina* shell (Fig. 33*a*, p. 74) served this purpose in a Medje family and is similar to those in favor with the Mangbetu, Mobali, Makere, and all tribes of the Ituri and Aruwimi and many of the Uele. Large, empty *Achatina* shells also make fine cups and may be seen floating in the pot of drinking water that stands in the corner of any well-kept hut, though small calabashes take their place farther north, in the plains of the Uele. Tessmann[1] records that the Pangwe of South Kamerun and Spanish Guinea cut out the main portion of an

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[1] G. Tessmann, 1913, Die Pangwe, I, pp. 151 and 161.

Achatina shell, using it as a spoon, or skilfully join large pieces of shell to a piece of wood which forms the handle, sometimes well decorated.

"Snails of all kinds, and especially the larger ones, enter into African folk-lore, as shown by the frequent use of the shells for amulets and similar charms. The strength of the *Achatina* and *Burtoa* shell, and the ease with which the snail withdraws to safety inside, has caused many curious comparisons in the imaginative mind of the native, recalling his own safe retreat deep in the forest, to which he retires when attacked; the analogy is complete, for these full-grown snails have no enemy but man. Considering the prevalence of superstition, one is not surprised to hear that the numerous shells dangling from the wrists and hip belts of the children, apparently decorative or for the amusement of the wearer, are really talismans to which the anxious mother ascribes the welfare of her little one. The medicine man who provides these charms collects certain species for certain types, but in every case the fundamental idea is the same, that children should and can always find a place of safety in case of danger, especially from the unseen visits of malevolent witchcraft, and from the attacks of leopards and snakes. The widely distributed fresh-water snails, of the genus *Melania*, so difficult to discover in their habitat, are said to confer invisibility and to confound enemies of the bearer after the shells have been treated by medicine men.

"Very often these big *Achatina* shells are fastened at short intervals to lianas, which are strung around plantations in the forest to frighten off pigs, antelopes, and other marauders. However, it is not the noise of the shells that is supposed to be effective, but the medicine put therein that offers the real protection to the crops.

"Certain Nilotic tribes, such as the Logo, Baka, and Mondo, still make from these shells a few strings of circular discs, often nearly a centimeter in diameter, though these have been practically replaced by a variety of beads imported by traders. The preparation of these discs is tedious and demands great patience. *Achatina*, *Limicolaria*, and especially *Burtoa* are broken with a stone. With an arrow or sharp pointed iron a hole is drilled in the middle of each piece and forty or fifty are strung on a thin iron rod and are ground down by being moved back and forth on a stone. This is a labor of love, usually performed by the grandmother, who establishes her quarters near a brook, for water greatly facilitates the process. By clever manipulation they finally assume their disc-like form and are strung on a fibre, when the process is repeated with oil until they are perfectly matched. Formerly, when these strings were more common, as many as ten were worn around the waist as the only garment. The photograph (Pl. XI, fig. 2) shows a representative string; the small piece of wood hanging in front is a talisman, at all times protecting the wearer, especially when away from her village. A Logo woman (Pl. XI, fig. 1) is wearing such a necklace and an armlet, heirlooms which are believed to have given the family its great prestige in the number of children. The shell discs are separated by human teeth, which, however, do not denote cannibalism, although they are the four upper and lower incisors of her own relatives, for the Logo, together with many other tribes, have the curious habit of extracting them at the age of puberty, thus warding off the great misfortune of being childless. A string of beads worn at certain periods by the prospective mother is supposed to confer special blessings. Many canines of small carnivores and the fangs of poisonous snakes are fastened by rings through holes in the ear lobes. In the upper lip an iron ring has been inserted, while a pendant of pointed monkey bone is passed through a hole in the lower lip" [H. L.].

ACHATINA Lamarck

Achatina LAMARCK, 1799, Mém. Soc. Hist. Nat. Paris, an VII, p. 75; monotypic for *Bulla achatina* Linné.

In view of the vast extent of the Congo Basin, the number of species of *Achatina* recorded from the Belgian Congo is remarkably small; but as yet only a fraction of the territory has been collected over. An exception must be made in favor of the Katanga region, where the species appear to be numerous and related to the forms of Angola and Rhodesia rather than to those of the regions northward. Probably no species occurs in both the forest and the savannah country.

The species of the Rain Forest appear to have been imperfectly understood. There is an excess of names for some of them. For this reason they are now somewhat fully illustrated. Most *Achatinæ* were described from few examples; and the long series of some species obtained by Lang and Chapin give an insight into the range of variation in pattern, color, and shape. Since similar variability may be expected in other species of the genus, it was thought desirable that the leading color patterns be figured.

Notes on the soft anatomy are given under *A. schweinfurthi*, the only species preserved in alcohol.

This genus includes the largest living land mollusks and is almost restricted to tropical Africa, where its northern and southern limits are still imperfectly known. Our map (Fig. 25), compiled by Dr. Bequaert, is based on such fragmentary records as have been published. These snails are common in Sierra Leone and there is even one old record of their occurrence on the banks of the Gambia River (at about 13° N. lat.). *A. schweinfurthi foureaui* Germain was described from the Damergu, also at about 13° N. lat. and *A. w. duperthuisi* Germain from the east side of Lake Chad. *A. erlangeri* Kobelt and v. Mœllendorff came from Ganale, in Gallaland, at about 7° N. lat. Definite data are still lacking for the regions connecting these four northermost localities, but it is significant that no *Achatina* is recorded in any of the four recently published papers on the molluscan fauna of the Anglo-Egyptian Sudan,[1] though *Limi-*

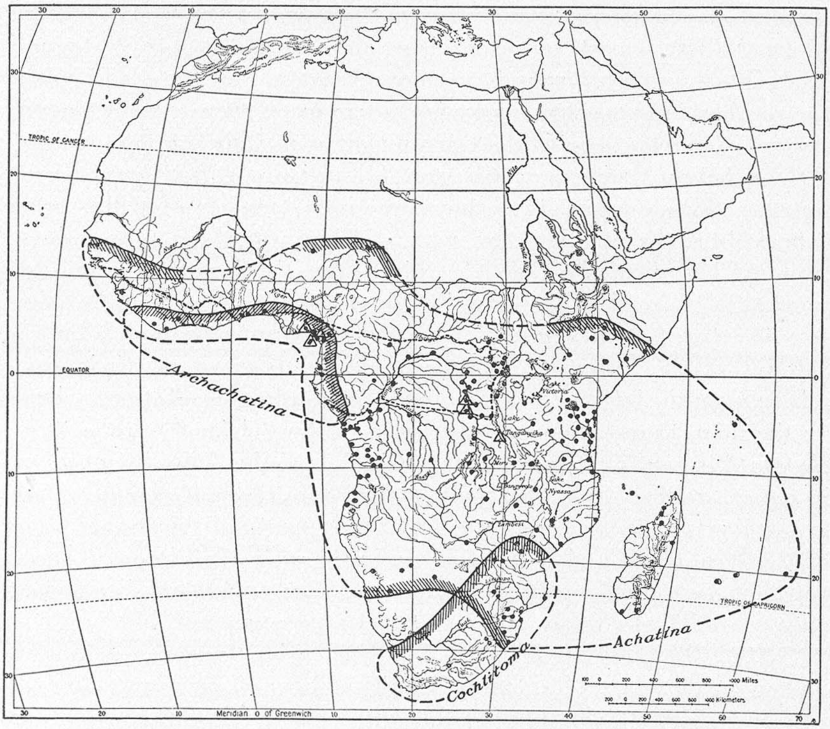
Archachatina
Achatina
Cochlitoma
Equator
Tropic of Cancer
Tropic of Capricorn
Meridian 0 of Greenwich
Miles
Kilometers
30
20
10
0
10
20
30
40
50
60
70

Fig. 25. Distribution of *Achatina, Archachatina,* and *Cochlitoma.* Locality records of species of *Achatina* are shown by dots; the triangles are the records of species of *Callistoplepa.*

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[1] R. Sturany, 1913, Sitz. Ber. k. Ak. Wiss. Wien, CXXII, 1, pp. 549-556. C. R. Bœttger and F. Haas, 1913, Proc. Malac. Soc. London, X, pp. 355-361; 1915, Zool. Jahrb. Abt. f. Syst., XXXVIII, pp. 371-384. J. Longstaff, 1914, Journ. Linn. Soc. Zool., XXXII, pp. 233-268.

colaria and *Burtoa* have been found in abundance there. South of the line Gambia-Damergu-Chad-Gallaland, *Achatina* is spread throughout Upper and Lower Guinea, the basins of the Congo, Upper Nile, and Zambesi, also in British and German East Africa, Angola, and Benguela. In German Southwest Africa there are several records for Damaraland and Great Namaland, the southern limit of the genus lying apparently at about 23° S. lat. (*A. dammarensis* Pfeiffer from Choarib and Choa district); in the interior *A. ampullacea* O. Bœttger and *A. dammarensis* Pfeiffer occur south of Lake Ngami on the banks of the Epukiro River. Along the East Coast, however, *Achatina* is found all over Portuguese East Africa, and a few species reach southeastern Transvaal and Natal; the southernmost locality known is Durban for *A. immaculata* Lamarck. Several species are nowadays commonly found on Zanzibar, the Comoros, the Seychelles, Madagascar, Réunion, Mauritius, and Rodriguez Island; but it is almost certain that they were introduced in the Mascarene Islands from the mainland by man. The genus seems to be absent from the islands of the Gulf of Guinea, the three records from Fernando Po being old and somewhat doubtful.[1]

The two following groups have been separated from *Achatina* on account of the different embryonic whorls; because of their close relationship to *Achatina*, their general distribution has also been shown on the map, though they are not found in the Belgian Congo. *Archachatina* Albers is West African, on the islands of the Gulf of Guinea and in the coastal belt from Monrovia to the Kuilu River (Gaboon). *Cochlitoma* Férussac is restricted to South Africa, south of the Orange River on the West Coast and of the Zambesi in the east. *Callistoplepa* Ancey, which is also closely related to *Achatina*, has apparently been found only in the West African and equatorial rain forest belt.

Achatina is essentially a snail of the lowlands; in the mountains and on the plateaus of Central Africa the number of species and individuals decreases at about 1200 m. and the genus is not found above 1500 m. This particularity of its distribution may partly explain its absence from Abyssinia. Both *Limicolaria* and *Burtoa* occur at much higher altitudes.

The *Achatinæ* are oviparous; their eggs are numerous, as many as 196 having been seen to be deposited by one individual; they are small, oval, 6 mm. long, pale yellow, with a hard but thin shell; they are deposited in loose soil just below the surface. Green's observations in Ceylon seem to show that these snails do little damage to the vegetation; they are largely scavengers, feeding upon excrement and decayed fruit. When estivating they secrete a pure white, calcareous epiphragm, about as thick as that of *Helix pomatia* and notched below to fit the contour of the aperture; in the narrow upper portion there is a slit outside and a raised ridge within, which "looks exactly as if a knife had been thrust through from the outside, so as to force the substance out into a ridge,"[1] which may be slightly slit along the summit or imperforate. "I found *A. rugosa* Putzeys estivating at Bukama (Katanga) in June 1911; it had burrowed itself about four inches down, in dry, loose soil, on a rather open and sunny spot, near the bank of the Lualaba River. The aperture was closed with a solid, white, porcellanous epiphragm, similar in texture to that of *Leucochroa candidissima*" [J. B.].

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[1] *Achatina fulica* (Férussac) was introduced in Calcutta in 1847 and on Ceylon about 1900. E. Green has given an interesting account of its sudden appearance in overwhelming numbers on Ceylon [1911, The Zoologist, (4) XV, pp. 41-45].

Parasites of *Achatina*

"Certain wingless flies belonging to the Phoridæ are, in their adult stage, rather closely associated with the large forest *Achatinæ.* These insects have been observed running about on the live snail. They offer several unique morphological features, doubtless adaptations to their aberrant mode of life. Since additional information on their habits is much needed and the few published data are scattered through periodicals easily overlooked by malacologists, an account of this peculiar form of symbiosis is given here.[2]

"O. F. Cook discovered a tiny fly which he named *Wandolleckia achatinæ* 'in the deep forests of Liberia, where it is found actively running about on *Achatina variegata* Roissy, the largest West African land snail.'[3] Wandolleck described and figured these flies as 'Cook'sche Gattung'[4] and added the following remark, probably on information given by Cook: 'They seem to feed on the slime of the snails. They are very swift runners; when disturbed they leave their host very quickly, but return to it later.' Brues has described another species, *Wandolleckia indomita*,[1] from Kibosho, German East Africa, but without mentioning its habits.

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[1] E. A. Smith, 1899, Proc. Malacol. Soc. London, III, p. 310, fig. ii.

[2] H. Schmitz, 1917, Biologische Beziehungen zwischen Dipteren und Schnecken, Biolog. Centralbl., XXXVII, pp. 24-43, gives a good review of these and other Diptera truly or supposedly associated with snails.

[3] 1897, Science, N. S., VI, p. 886; abstract of the minutes of the Biological Society of Washington. The name *Wandolleckia cooki* Brues (1903, Trans. Amer. Ent. Soc. Philadelphia, XXIX, pp. 337, 392, and 400) is a synonym of *W. achatinæ;* it is not accompanied by a description and was proposed merely in the belief that the species had never received a name.

[4] B. Wandolleck. 1898. Die Stethopathidæ, eine neue flügel- und schwingerlose Familie der Diptera. Zool. Jahrb. Abt. f. Syst., XI, pp. 412-439, Pls. xxv-xxvi.

"*Wandolleckia biformis* H. Schmitz[2] was found during my stay at Lesse in the Semliki Forest (March 1914). On a rainy morning a very large *Achatina*[3] was crawling over decaying leaves in a dense forest patch. On closer examination, sixteen wingless flies were seen running swiftly over the mantle and under the shell of the snail, entering even the pulmonary cavity; with them were two mites and a single specimen of a minute, very slender larva of some beetle.

"*Wandolleckia* differs widely from the usual type of fly, looking much more like a flea or a mite. Wings, halteres, and ocelli are lacking; the eyes are very small, reduced to about thirty hemispherical facets; the legs are long and slender. *W. biformis* is dimorphic.[4] The largest individuals, about 2 mm. long, present a pronounced physogastrism, their abdomen being much inflated and dirty yellow, while head and thorax are dark chocolate brown; the stenogastric specimens are much smaller (1.1 mm. long), uniformly pale yellow, with depressed abdomen; both kinds of individuals are females and their morphological structure is the same. Dimorphism in this case is evidently due to a further development of the insect during its adult stage, a most unusual feature. The increase of the abdomen results from the imaginal hypertrophy of the reproductive organs, in connection with some unknown ethological peculiarity. The reproducing habits of *Wandolleckia* have not been observed; only females are known thus far. It is possible that males, either winged or wingless, will be discovered, though hermaphroditism is not altogether impossible.[5] Another point still in the dark is the food of these tiny flies. They are, it seems, perfectly harmless to their host and they may feed merely on the slimy excretion of the mantle, as has been suggested.[6]

"Stuhlmann has observed pale green mites on two species of *Achatina* (*A. schweinfurthi* and *A. stuhlmanni*) in the Semliki Forest[7] and, as mentioned above, I have found them in similar conditions with *Wandolleckia*. These mites have not been described" [J. B.].

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[1] 1907, Ann. Mus. Nat. Hungar., V, p. 412.

[2] H. Schmitz, 1916. Neue Phoriden aus Belgisch-Kongo, gesammelt von Dr. Jos. Bequaert, Zool. Mededeel. Mus. Nat. Hist. Leiden, II, pp. 1-10.

[3] This snail is not available for specific identification.

[4] This is possibly true also of the other members of the genus.

[5] Wasmann (1901, Zeitschr. f. wiss. Zool., LXX, pp. 293-294; 1902, Verh. 5. Zool.-Congr. Berlin, pp. 862-865) claims to have discovered proterandrous hermaphroditism in *Termitoxenia*, a genus of wingless flies related to the Phoridæ and living in termite nests.

[6] It is recommended to preserve study material of these flies in clean alcohol. The epizoic *Wandolleckia* must not be confused with other phorids which can be commonly bred from dead, decaying snails.

[7] H. Stuhlmann, 1894, Mit Emin Pascha ins Herz von Afrika, p. 313. E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., pp. 86 and 92.

13. **Achatina bandeirana** Morelet

Plate I, Figure 3

Achatina bandeirana A. MORELET, 1866, Journ. de Conchyl., XIV, p. 156; 1868, Voy. Welwitsch, Moll. terr. et fluv., p. 67, Pl. VI, fig. 1 (type locality: on rocky hills of the district Pungo Andongo, Angola). DAUTZENBERG, 1891, Bull. Ac. Sci. Belgique, (3) XX, (1890), p. 567. ANCEY, 1902, Journ. de Conchyl., L, p. 279. PILSBRY, 1904, Man. of Conch., (2) XVII, p. 19, Pl. III, figs. 20 and 21.

In the grassy plain of Banza Manteka (on the caravan route between Matadi and Lukungu; Dupont Coll.). Ancey reports this species from Landana.

Kunga, on the estuary of the Congo River, 46 specimens (Lang and Chapin Coll.).

The specimens from Kunga are larger than Morelet's type of *bandeirana* with about the same number of whorls.

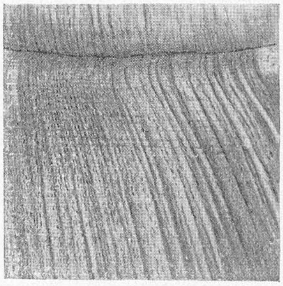

Fig. 26. *Achatina bandeirana* Morelet. Magnified detail of sculpture from front of last whorl, representing an area of 15 mm. square.

The shell is solid, lengthened ovate. The early whorls are denuded of cuticle and white; subsequent whorls of the spire are covered with a thin naples to mustard-yellow cuticle. On the third whorl pale brown vertical streaks appear, at first narrow and rather close, but from the fifth to the penult whorls they are unequal and unevenly spaced, the larger ones widening downwards, cameo-brown. The last whorl is tawny, with tawny to chestnut streaks running with the lines of growth and shading into the ground-color. There is a chestnut girdle about 2.5 mm. wide at the periphery. Under the cuticle, the shell is white. Sculpture (Fig. 26) of very fine anastomosing axial striæ cut into distinct granules by spiral impressed lines, on the spire; the last two whorls having rather close, low but distinct growth-wrinkles, covered with a minute sculpture of long, curved granules arranged in spiral series. The whorls are rather convex. The aperture is more than half the total length (7:13), pale neropalin blue within. The columella is white, vertical with a spiral median concavity, the base abruptly truncate.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
130 mm.	62 mm.	70.0 mm.	8½	Pl. I, fig. 3
143	72	74.0	8⅔	
139	65	73.5	9	
122	63	66.0	8⅓	2 bands

This is a more capacious shell than *A. balteata* Reeve; the sculpture is less coarse; and the columella is much less concave. *A. infrafusca* v. Martens approaches it in shape but it has far coarser granulation.

The peripheral chestnut band is invariably present in the series collected. A few examples show a second band above the peripheral.

No doubt this species is *Achatina balteata* Reeve var. *infrafusca* v. Martens of C. R. Bœttger,[1] reported from Banana.

14. **Achatina tincta** Reeve

Plate IV, Figure 4; Plate V, Figures 2 and 3

Achatina tincta Reeve, 1842, Proc. Zool. Soc. London, p. 55; 1842, Conch. Syst., II, p. 88, Pl. clxxix, fig. 18 (type locality unknown). Pfeiffer, 1869, Malak. Blätt., XVI, pp. 253-256, Pls. i-ii. Dautzenberg, 1891, Bull. Acad. Sci. Belgique, (3) XX, (1890), p. 567. Pilsbry, 1904, Man. of Conch., (2) XVII, p. 12, Pl. xviii, fig. 23 (copy of Reeve's description and figure). Germain, 1907, Bull. Mus. Hist. Nat. Paris, p. 426; 1913, *op. cit.*, pp. 284 and 355. C. Bœttger, 1913, Ann. Soc. Malacol. Belgique, XLVII, (1912), p. 93.

Achatina oblitterata Dautzenberg, 1891, Bull. Ac. Sci. Belgique, (3) XX, (1890), p. 567, Pl. i, fig. 1 (type locality: Leopoldville). Germain, 1913, Bull. Mus. Hist. Nat. Paris, p. 284. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 23.

Achatina lhotelleriana Preston, 1909, Ann. Mag. Nat. Hist., (8) IV, p. 88, Pl. iv, fig. 2 (type locality: San Antonio, left bank of Congo delta).

This species was previously known in the Belgian Congo: Banana (Hesse Coll.); Leopoldville (Dupont Coll.); île de l'Eléphant, between the Stanley Pool and Kwamouth, on the Congo River (Bequaert Coll.). It is also recorded from San Antonio (Angola), Brazzaville, Pays M'Bagba (Lobay R.), and Fort Rousset (French Congo). Its range would thus be the Congo Basin between 4° N. lat. and 6° S. lat.

Malela, 316 specimens; and Moanda, 27 specimens (Lang and Chapin Coll.). Zambi, 4 specimens (Bequaert Coll.).

This is a solid, almost smooth shell, showing traces—often faint—of granulation on some upper whorls only; typically chamois colored with the earlier whorls light corinthian red; marked with irregular stripes of chestnut black, which are often bordered with chestnut brown on the

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[1] 1913, Ann. Soc. Malac. Belgique, XLVII, (1912), p. 94.

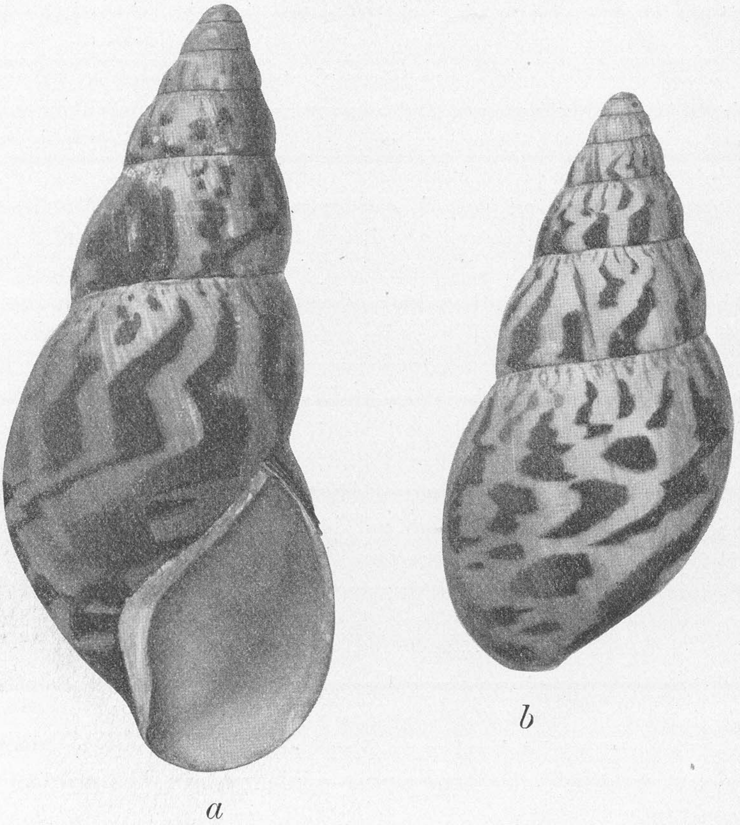

Fig. 27. *a* and *b*, *Achatina tincta* Reeve.

left side; the interior, parietal callus and columella bluish white. Columella varying from nearly straight to distinctly sigmoid (Pl. IV, fig. 4; text fig. 27).

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
94 mm.	45 mm.	44.5 mm.	8½
101	45	44.0	8½
78	40	40.0	8
76	33	34.0	8⅓

The early work of Reeve and Pfeiffer on this species has been noticed in Manual of Conchology, (2) XVII, p. 12. Preston, when describing *A. lhotelleriana*, stated that the type of *A. tincta* Reeve had been lost and that the original "figure has all the appearance of a young specimen of *A. variegata* Lk." At the same time, he referred the figure in Reeve's Conchologia Iconica to "a varietal form of *A. weynsi* Dautz."

After carefully going over the subject, I find myself in agreement with Pfeiffer, Dautzenberg, and Germain in the identification of this common snail of the Lower Congo. *A. lhotelleriana* Preston is, in my opinion, a synonym of the typical form of *A. tincta*.[1]

Dupuis has stated that *A. oblitterata* Dautzenberg is "une simple variété albine de l' *Achatina tincta* Reeve."[2] Except for the reference to albinism, this is undoubtedly correct. It is a mutation of *A. tincta*, living in the same colonies, and undoubtedly interbreeding, but the hybrids show good segregation. It may be noted that the *tincta* and *oblitterata* color forms have been found together in Angola (Pfeiffer), at Leopoldville (Dautzenberg), in the Pays M'Bagba, French Congo (Germain), and in two localities, Malela and Moanda, by Lang and Chapin.

Mut. *oblitterata* (Pl. V, figs. 2 and 3) has the same ground color as *tincta*. Both vary from old gold nearly to deep colonial buff. The summit is generally light corinthian red, but sometimes very faint, or very rarely it is white. Markings are sometimes absent, but usually there are indistinctly defined chestnut flames, rarely extending upon the base, and sometimes confined to two or three whorls, not extending below the penult or the next earlier whorl. Up to this point, the divergence from *tincta* has been merely in the color of the markings, and the extent of their development; but *oblitterata* has a new feature in the color of the columella and parietal callus. These are invariably roseate—or, to be exact, alizarine pink to vinaceous—while in *tincta* the blue-white tint is constant.

The size is the same as in typical *tincta*. In the lot of 316 specimens taken at Malela, 118, about 37 per cent, are the mut. *oblitterata*, the rest typical *tincta*.

"All of the specimens from Malela were collected in the same village, where they occur chiefly in plantain and oil-palm plantations. In the estuary of the Congo the villages are established between the mangrove and *Raphia* swamps on the higher portions. The snails are found under the dry leaves of palms and other plants that cover the decaying vegetation. As such conditions are lacking in mangrove swamps, they are only to be looked for in places inhabited by natives" [H. L.].

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[1] Reeve's original figure of *tincta* shows a smaller apex than our specimens, but that was doubtless an error of the artist. *A. zebra*, on the same plate, is also drawn with the apex too small. The figure and description could not possibly be applied to young *A. variegata*, in my opinion, based upon comparison with *variegata* at about the same size. Pfeiffer also saw and described Reeve's type specimen; he would surely have recognized a young *variegata*.

[2] 1911, Rev. Zool. Afric., I, p. 178.

15. **Achatina pfeifferi** Dunker

Achatina pfeifferi Dunker, 1845, Zeitschr. f. Malak., II, p. 163; 1853, Index Moll. Guin. Infer., p. 7, Pl. I, figs. 39 and 40 (type locality: Loanda). Pilsbry, 1904, Man. of Conch., (2) XVII, p. 24, Pl. XXXVIII, figs. 25-28.

Zambi, 32 specimens, nearly all young (Lang and Chapin Coll.).

In these examples the spire from the third to the penult whorls is very beautifully granulose except for a narrow smooth band above the suture. The spire is also a little wider than in typical *A. pfeifferi*. It is probably a local race which may be called **Achatina pfeifferi eugrapta** (Fig. 28). As in most examples of *A. pfeifferi*, the oblique stripes abruptly give place, on the last half whorl, to narrow streaks in the direction of growth-lines.

Length, 35.6 mm.; diameter, 15 mm.; aperture, 14.7 mm.; 7½ whorls; adult specimen.

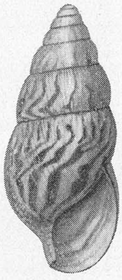

Fig. 28. *Achatina pfeifferi eugrapta*, new subspecies. Zambi.

16. **Achatina sylvatica** Putzeys

Achatina sylvatica Putzeys, 1898, Ann. Soc. Malacol. Belgique, XXXIII, Bull. Séances, p. lxxxiii, fig. 19 (type locality: forest of Musungu Kifuluka, below Nyangwe). Pilsbry, 1904, Man. of Conch., (2) XVII, p. 28, Pl. XVII, figs. 14-16. Not *Achatina sylvatica* (Spix) Pfeiffer = *Columna sylvatica* Spix, now placed in the genus *Obeliscus*.

Achatina putzeysi Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 26; new name.

This species is known only from the forests along the Upper Congo: below Nyangwe (Dupuis Coll.); Nouvelle Anvers, La Lowa, Ankoro (Bequaert Coll.).

Stanleyville, 50 specimens, and Mobeka, 170 specimens (Lang and Chapin Coll.).

Sixteen of the specimens from Stanleyville are uniform colonial buff or naples yellow. This form, which may be called mutation **unicolor** (Fig. 29*g* and *h*), has been noted also from Nouvelle Anvers by Dautzenberg and Germain. Lang notes that at Stanleyville these snails were found in the grass.

The striped specimens vary widely, as shown in Figs. 29*a* to *f*, from evenly streaked to spotted. There is always a dark patch around the columella. Stanleyville shells measure:

	Length	*Diameter*	*Length of Aperture*
Average specimen.........	39.5 mm.	19.0 mm.	20.4 mm.
Broadest specimen.........	41.5	20.5	21.5
Narrowest specimen.........	39.5	17.0	18.0

A long series taken at Mobeka includes both unicolored (125) and streaked (45) shells. They are buckhorn brown, often a little darker, dresden brown, on the base; the streaks, when present, are not broad or very conspicuous, and are auburn or darker. There are five unicolored specimens having the light color of those from Stanleyville. One of the largest examples measures: length, 44.5 mm.; diameter, 22 mm.; aperture, 22 mm.; 7⅓ whorls.

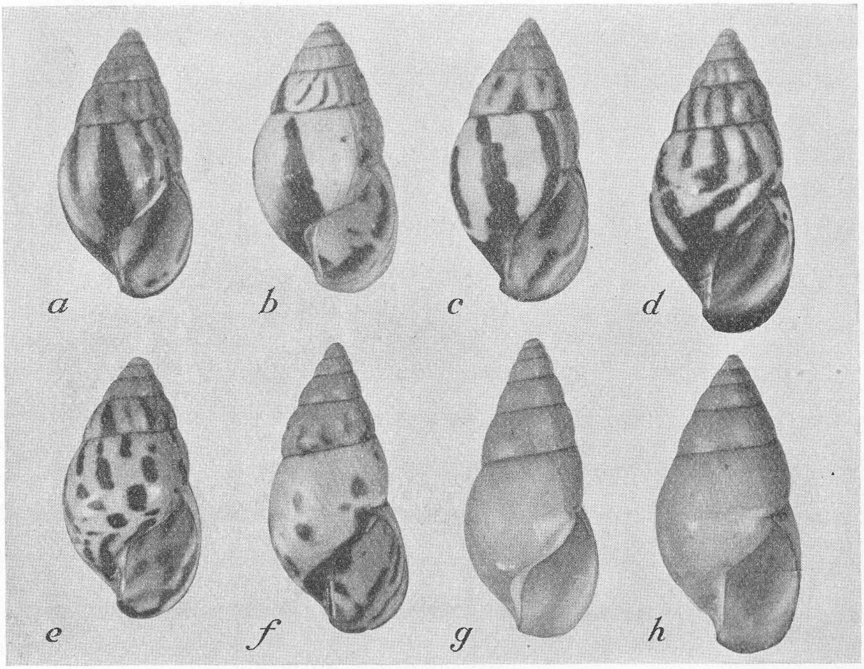

Fig. 29. *a* to *h*, *Achatina sylvatica* Putzeys; series from Stanleyville showing variation of shape and pattern; *g* and *h* being the mutation *unicolor*.

The name *A. sylvatica* has been changed to *A. putzeysi* by Dautzenberg and Germain on account of the prior *Achatina sylvatica* of Pfeiffer.[1] But Pfeiffer's name was merely a new combination for the prior *Columna sylvatica* Spix, and that species is not now considered to be an *Achatina*. The rules of nomenclature governing such cases do not require a change of the name.

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[1] 1841, Symbolæ ad Hist. Heliceorum, II, p. 29.

17. **Achatina weynsi** Dautzenberg

Plate XIII, Figures 2, 2*a* and 2*b*

Achatina weynsi Dautzenberg, 1899, Ann. Soc. Malacol. Belgique, Mém., XXXIV, p. 27, fig. on p. 28 (type locality: Upper Congo). Pilsbry, 1904, Man. of Conch., (2) XVII, p. 11, Pl. xvii, fig. 17 (copy of description and figure). Germain, 1913, Bull. Mus. Hist. Nat. Paris, p. 284.

Described without definite locality from the "Upper Congo,"[1] this snail was also recorded from Irebu, on the shores of Lake Tumba (Poutrin Coll.).[2] The known localities lie between Bumba and Irebu on the Middle Congo, and Lake Chad northward.

Nouvelle Anvers, 81 specimens; and near Bumba, 2 specimens (Lang and Chapin Coll.).

According to P. Dupuis,[3] this form is a synonym of *A. schweinfurthi* v. Martens. The differences of color, size, and shape appear amply sufficient to give it standing as a species, at least until intermediate forms are shown to exist by means of a series of figures or, at least, of measurements. The two species inhabit distinct though contiguous regions, so far as we know. *A. weynsi* is not certainly known farther east than Bumba.

H. B. Preston[4] has referred Reeve's later figure of *A. tincta*[5] to a varietal form of *A. weynsi*. The figure certainly looks very similar to that; yet, as *weynsi* is known only from the Middle Congo, it is not clear how a specimen reached London as early as 1849.

In some individuals from Nouvelle Anvers the pattern is typical, of broad chestnut-brown stripes, the ground tint being chamois, or in old shells, whitish from loss of the cuticle. This pattern has been beautifully figured by Dautzenberg. Others have narrow stripes, either vertical or oblique (Pl. XIII, figs. 2, 2*b*) or the dark color may cover the surface except for some whitish spots near the suture (Pl. XIII, fig. 2*a*). The summit is either ferruginous or dull purple, the columella and interior bluish white. The columella varies from nearly straight to strongly concave.

Mutation **rosaxis**

Plate XIV, Figure 2

Three specimens from Nouvelle Anvers have pale cinnamon stripes on a chamois ground, the stripes lacking on the last whorl in one, weak in another specimen. The columella is corinthian pink or paler, the summit japan rose or more purplish.

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[1] The distinction between "Haut" and "Moyen Congo" is somewhat vague. Dupuis professes to know the exact locality where Weyns collected *A. weynsi*, but he has not imparted that information.

[2] Germain, *op. cit.*, p. 284, misspells this locality Trebou.

[3] 1911, Rev. Zool. Afric., I, p. 178.

[4] 1909, Ann. Mag. Nat. Hist., (8) IV, p. 88.

[5] 1849, Conch. Icon., V, Pl. xi, fig. 29.

This mutation is parallel to the mut. *oblitterata* of *A. tincta* Reeve, differing from the typical form in exactly the same manner.

Two examples of *A. weynsi* were taken at Bumba (on the Congo River about midway between Stanleyville and Nouvelle Anvers). One is marked somewhat as in Pl. XIII, fig. 2, but with the summit paler, the other being the mutation *rosaxis.*

Specimens from Nouvelle Anvers were submitted to M. Dautzenberg, who kindly reported on them as follows: "La coquille que vous m'avez envoyée sous le nom d'*Achatina weynsi* est bien cette espèce dont le dessin est très variable. Celui avec flammules en zigzag et que j'ai considéré comme typique était le plus fréquent dans la récolte du Capitaine Weyns au Haut Congo. Mais j'ai rencontré deux exemplaires dont la face antérieure du dernier tour est ornée de flammules très obliques tandis que la partie dorsale présente des flammules longitudinales comme l'exemplaire que vous m'avez envoyé. Je vous adresse par la poste un exemplaire de cette disposition."

The specimens figured measure as follows:

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
114.5 mm.	60.0 mm.	57.0 mm.	8⅓	Adult
92.0	48.5	49.5	8	Adult
89.0	46.0	48.0	8	Immature
99.0	52.0	55.0	7⅔	Mut. *rosaxis*

Germain has described a form from Kanem, on the east side of Lake Chad, as *A. weynsi* var. *duperthuisi.*[1] This has been listed as *A. weynsi* var. *dupetithouarsi* Germain by Kobelt.[2]

18. **Achatina schweinfurthi** E. v. Martens

Plate I, Figure 4

Achatina schweinfurthi E. v. Martens, 1873, Malak. Blätter, XXI, p. 40 (type locality: in Niam-Niam Land, 5° N. lat., on Mt. Baginze); 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 85. Pilsbry, 1904, Man. of Conch., (2) XVII, p. 61, Pl. vii, fig. 15. E. A. Smith, 1909, Trans. Zool. Soc. London, XIX, p. 44, Pl. i, fig. 8 (var.). P. Dupuis, 1911, Rev. Zool. Afr., I, p. 177. J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 205.

Apparently a common species in the eastern regions of the Belgian Congo: Mt. Baginze on the divide between the Nile and the Congo Basins, at about 29° E. long. (Schweinfurth Coll.). Forest on the western slope of Mt. Ruzenzori, between Karevia and Kiviriri; in the region of Andetei, west of the Semliki River (Stuhlmann Coll.). Nsendwe, Lokandu, Piani Kapuri, Ponthierville, Stanley Falls, in the forest on both banks of the Congo River (Dupuis Coll.). Between Mawambi and Avakubi (Schubotz Coll.). Whether all of these records pertain to the typical form of the species is doubtful.

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[1] 1908, in A. Chevalier, L'Afrique Centrale Française, p. 489, fig. 88.
[2] 1909, Abhandl. Senckenb. Naturforsch. Ges., XXXII, p. 65.

Niangara, 7 specimens; Medje, obtained from natives (Lang and Chapin Coll.).

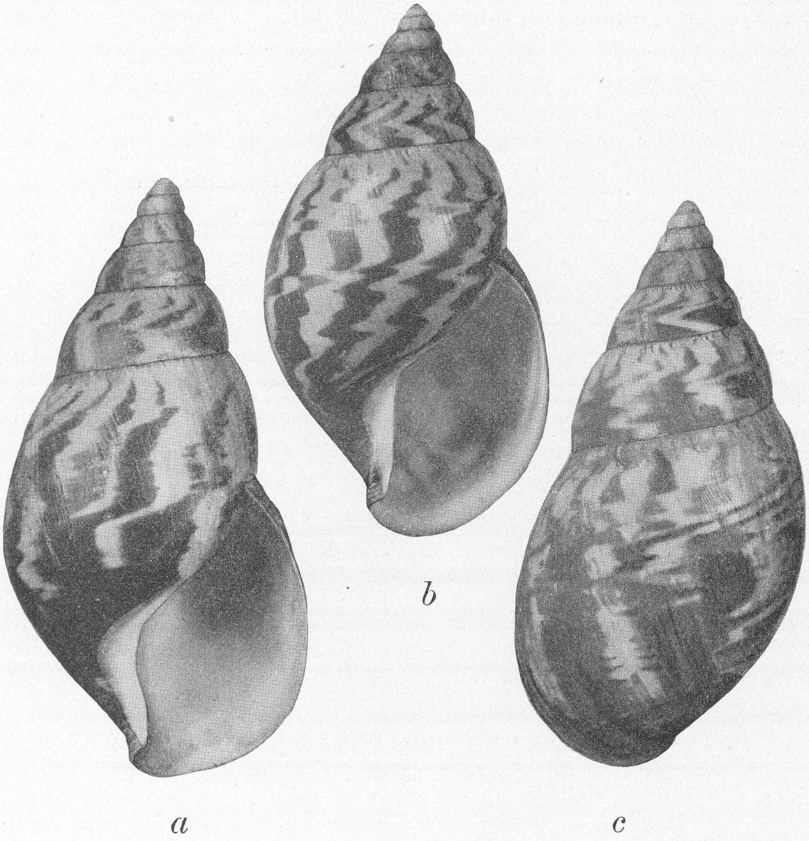

Fig. 30. *a*, *b*, and *c*, *Achatina schweinfurthi* v. Martens, from Niangara; half natural size; illustrating variations of color pattern and shape of the columella.

Niangara is about 130 kilometers southwest of Mt. Baginze in the Niam-Niam country, the type locality of the species. Except that they are larger, the shells (Fig. 30*a*, *b*, and *c*) agree well with the original description and figures. The irregular, zigzag, russet stripes are on a ground of mustard to naples yellow. The worn early whorls are pure white, or in two specimens faintly pink-tinted. The very fine granulation is distinct and arranged spirally on the spire, weaker or often quite faint on the last whorl. The plication or puckering below the suture is rather strong, and sometimes there is a line defining a sutural margin. The aperture is white within, clouded and suffused with pale medici blue. The columella is white; it varies in form, as shown in the figures; in an oblique view in the mouth it has a rather strong reversed-S curvature.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
135.0 mm.	67 mm.	70 mm.	8½
141.5	77	80	8
145.0	79	83	8¾
146.0	72	79	8½
171.0	83	85	9

A subspecies having the aperture more expanded, *A. s. foureaui* Germain, has been described from Sabaukafi, Damergu.[1] Much farther south *A. buchneri* v. Martens,[2] from the Kwilu River, an affiuent of the Kasai, in the Angola back country,[3] appears to differ from *schweinfurthi* in little but the narrower shape, hardly a specific distinction.

E. A. Smith has figured a form "peculiar on account of the absence of the dark irregular brown markings upon the last two whorls; these are covered with a yellow periostracum." It is from Mt. Ruwenzori and has more the color pattern of my *A. osborni* (see below).

The preserved animal is blackish brown with slightly paler bands from the mantle to the ocular tentacles. The foot is rounded above, not flattened under the shell, and pointed posteriorly. There are no facial or genital furrows. Surface coarsely granose. The jaw has very fine, sharp riblets. The salivary glands are enormous, 44 mm. long and slightly united above. Their ducts are long.

The pallial organs do not differ materially from the figure of *A. chrysoleuca*, given in Man. of Conchology, (2) XVII, Pl. XLIV, fig. 64. The lung is 85 mm. long; kidney, 48 mm. long, 9 mm. wide; pericardium, 21 mm. long.

The genitalia (Figs. 31 and 32) are pale grayish vinaceous, the lower half of the uterus olivaceous black. The vas deferens is large and free as usual. It enters at the distal third of the penial sheath, is bent distad, then enters the penis which has a coarsely furbelowed and finely plicate internal wall. The penial retractor is inserted at the junction of the vas deferens and penis. The sheath extends some distance beyond the loop formed by penis and epiphallus. In most other species anatomically known the loop emerges.

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[1] 1908, Mission Chari-Lac Tchad. L'Afrique Centrale Française, p. 488, fig. 87.

[2] 1882, Jahrb. D.Malak. Ges., IX, p. 245; 1882, Conch. Mittheil., II, p. 138, Pl. XXVI.

[3] On many recent maps this river is called the Djuma. According to the map published in Petermann's Mittheilungen for 1883, Buchner's route crossed the Kwilu River at about the present border line between the Belgian Congo and Angola.

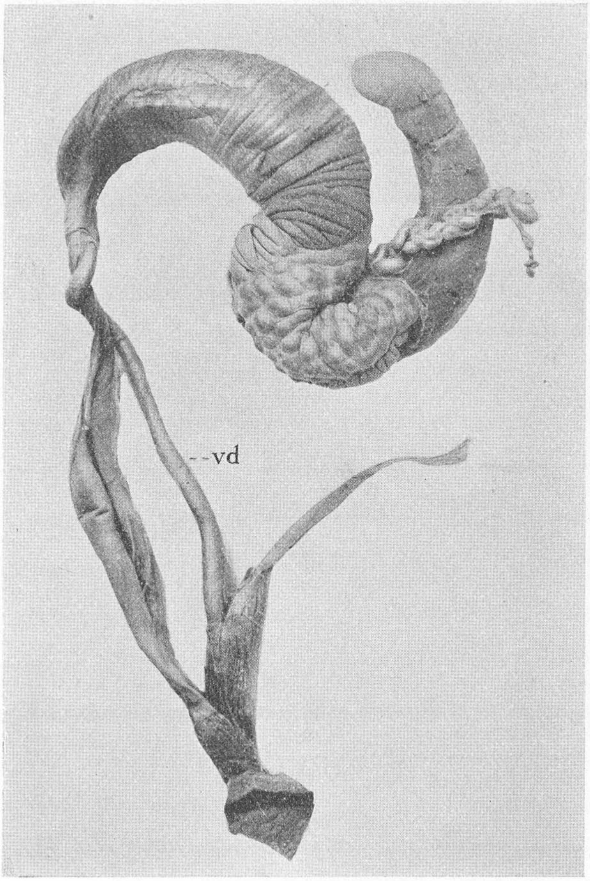

Fig. 31. *Achatina schweinfurthi* v. Martens, genitalia; natural size (photograph): vd, vas deferens.

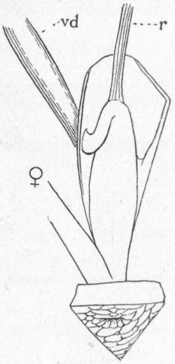

Fig. 32. *Achatina schweinfurthi* v. Martens, penis with sheath opened: r, penial retractor; vd, vas deferens.

Length of the penis, 23 mm.; of the vagina, 26 mm.; of the spermatheca and duct, 27 mm.

A very large specimen (Fig. 33*a*) of this species was obtained at Medje from the natives, who used it to hold salt. It is remarkable for an injury to shell and mantle in the sixth whorl, which produced at first a furrow and, two thirds of a whorl later, a keel, continuing to the lip, where it terminates in a notch. This shell measures 152 mm. long, 84 mm. wide.

Young shells of *Achatina* about 40 mm. long, probably referable to *A. schweinfurthi*, are pierced and strung as bracelets in the same locality (Fig. 33*b*).

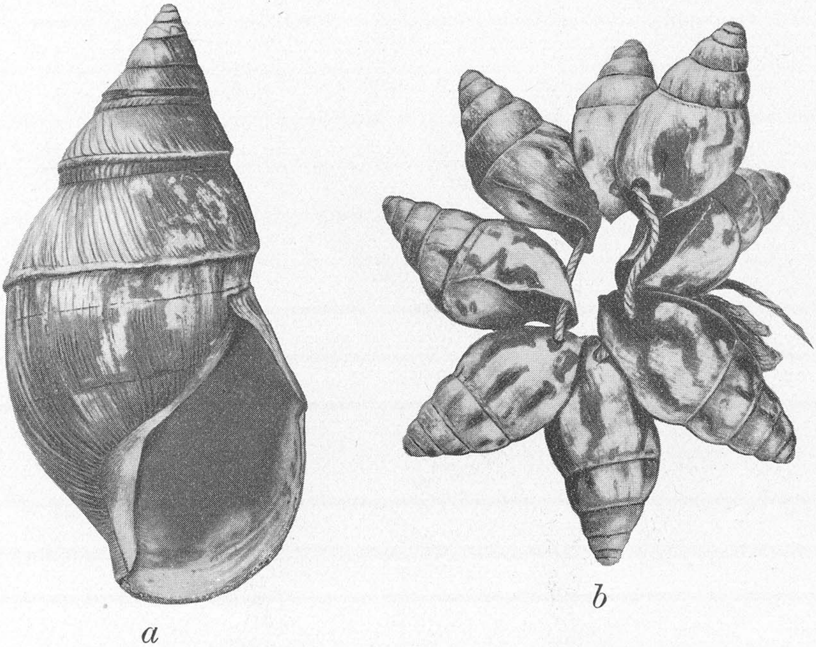

Fig. 33. *Achatina schweinfurthi* v. Martens. *a*, an abnormal shell used by natives as salt container, Medje; × ½; *b*, young shells used as wristlets by natives, Medje; × ¾.

19. **Achatina schweinfurthi rhodacme**, new subspecies

Plate II, Figures 1 to 3; Plate IX, Figures 1 to 7; Plate X, Figure 1

Stanleyville, type locality, about 90 specimens (Lang and Chapin Coll.). Lubutu, 1 specimen (Bequaert Coll.).

The shell is more slender than *schweinfurthi*. Four or five whorls at the summit are jasper pink; the last whorl naples yellow to chamois above the periphery, darker below it (honey-yellow to tawny), marked with irregular or zigzag stripes of carob brown. Sculpture as in *A. schweinfurthi*, of very minute granules, weaker on the last whorl. There is no plication or puckering below the suture, or it is very slight, and a subsutural margin is defined by a spiral impression (sometimes wanting). Aperture wedgewood blue within, the columella paler, not much but irregularly curved.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
150 mm.	72 mm.	70.0 mm.	9	Type
139	68	68.0	9	
131	61	62.0		
123	66	63.5	8½	

It is easily distinguished from *A. schweinfurthi* by the roseate summit, darker stripes and more slender contour. While it is a much larger shell than *A. weynsi*, the summit is smaller. It differs also by the narrower aperture and by having the last whorl decidedly less convex in the upper part. It is possible that intermediate forms may occur, but I have seen no evidence of them.

The series shows wide variation in coloration. Often the division of the ground tint is not conspicuous, other individuals being distinctly bicolored. In two or three individuals the stripes are russet (Pl. II, fig. 3) and the aperture nearly white. The chief variations of pattern are illustrated on Plate IX. Sometimes the pattern changes abruptly, in shells which have not been broken, as in Pl. IX, figs. 4 and 4*a*, back and face of one shell.

Several shells are readily separable from the rest by having the whorls less convex, and the aperture decidedly narrower and longer. They are possibly from a separate colony or represent another mutation. Pl. IX, figs. 4, 4*a*, 5, 6, and 7 represent four of these. The narrow striped pattern of Fig. 6 is unusual in this species.

The two following mutations were found in the series of *A. s. rhodacme* from Stanleyville, presumably from the same colony as the typical form.

Mutation **rhodostemma**

Plate III, Figure 4

Eight specimens. The shell is darker than *A. s. rhodacme,* with summit of the spire jasper pink color; last whorl hazel above, almost chestnut below the periphery, the stripes blackish chocolate. The aperture is light lavender-blue with darker clouds. Columella rather narrow with a median twist, its inner face vinaceous. The lip is brown-edged. Sculpture and form as in *A. s. rhodacme.*

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
122 mm	59 mm.	60.0 mm.	8½	Type
132	59	57.0	8½	
129	65	66.5	8	

Mutation **levior**

Plate III, Figure 3

One specimen. The shell resembles the mutation *rhodostemma* in color and sculpture. It differs by being thinner, lighter, with shorter whorls which are more convex. Interior hematite red; columella vinaceous.

Length, 102 mm.; diameter, 53 mm.; length of aperture, 52 mm.; 8 whorls.

While the shell has much in common with the preceding mutation, the differences are so marked that, if found to be constant, it will doubtless be elevated to specific rank. The type specimen weighs about 1⅓ oz., while the type of mut. *rhodostemma*, a somewhat larger shell, weighs 3 oz.

It is a fully adult shell, as the band of rough growth-lines behind the lip shows.

This form is about the size of *A. weynsi* but the summit is smaller, the shell thinner, the last whorl distinctly granulose throughout, and it differs in coloration.

20. **Achatina rugosa** Putzeys

Achatina rugosa Putzeys, 1898, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIII, p. lxxxiii, fig. 18 (type locality: forest of Micici in the Manyema). Dupuis and Putzeys, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. lx. Pilsbry, 1904, Man. of Conch., (2) XVII, p. 30, Pl. xxxiii, figs. 8-9; Pl. xxxiv, fig. 12. Germain, 1908, Rés. Scientif. Voy. Afr. Foà, p. 629, fig. 1 (on p. 630).

Achatina iostoma Pfeiffer. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 24.

Apparently a common species in the Upper Congo: Micici, Musungu Kifuluka, Nsendwe, Lokandu, Ponthierville, Stanley Falls; all these localities are in the Rain Forest on the right bank of the Congo River (Dupuis Coll.). Bukama (Bequaert Coll.).

The Lang and Chapin collection includes two specimens of a quite coarsely granular form from Ngayu.

Dautzenberg and Germain consider *A. rugosa* a synonym of *A. iostoma* Pfeiffer,[1] a species of Kamerun. I have not seen sufficient material to form an opinion.

Another series of 24 specimens in the Lang and Chapin collection represents a race related to *A. rugosa* but much smoother and especially more glossy. The shell is marked with blending streaks of deep colonial buff, olive-ochre, and cinnamon-brown, and usually shows chestnut-brown stripes on the spire, rarely on the last whorl also. The upper whorls are worn, ochraceous or with a pink flush. The aperture, parietal wall, and columella are blue-white. The whorls are moderately convex. The spire is minutely granular. The last whorl is closely, very finely striate spirally, the striæ minutely broken into granules, at least on the upper part of the whorl, and everywhere they are undulated, passing over weak longitudinal wrinkles. This sculpture is similar to that of some delicate forms of *A. rugosa,* but the longitudinal wrinkles are weaker.

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[1] *Achatina iostoma* Pfeiffer, 1852, Proc. Zool. Soc. London, p. 86. The original description, figure, and subsequent references may be found in Pilsbry, 1904, Man. of Conch., (2) XVII, p. 32, Pl. xvii, fig. 18; Pl. xlii, fig. 10.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
105 mm.	52 mm.	58 mm.	8
106	48	58	8

As the label was lost, the form is noted merely to show that an undescribed race of *A. rugosa,* or a closely allied species, exists in the region covered by the Expedition. Lang's impression is that the shells are either from about Moanda or from the Uele—localities sufficiently remote from each other!

21. **Achatina osborni,** new species

Plate IV, Figure 6

Masisi, in the Rain Forest, at 1800 m.; 2 specimens (Bequaert Coll.).

The shell is oblong-ovate, thin. First two whorls pink, next two whitish; waved brown stripes appear on the third whorl, continuing as far as the fifth, after which the shell is covered with a thin cuticle, bay on the lower half, but lighter with indistinct bay streaks above the periphery, and becoming ochraceous near the suture. Sculpture of low unequal growth-wrinkles covered with a very fine granulation, the granules arranged spirally on the penult whorl, but spiral lines are indistinct and only visible in a few places on the last whorl. There are 7¾ whorls, rather weakly convex, the later ones plicate below the suture, which is not deeply impressed. The aperture is piriform, light columbia blue within, the posterior angle very acute. Columella white, nearly straight, strongly truncate at the base. The peristome is edged with dirty buff.

Length, 141 mm.; diameter, 66 mm.; length of aperture, 76 mm.

Distinct by its thin texture and dark color, the absence of stripes on the later whorls, and the posteriorly acuminate aperture. The sculpture is far more minute than that of *A. rugosa. A. graueri* Thiele, from Kwidjwi Island, has some resemblance to *osborni* in color, but it differs radically by the narrow spire and small summit; the malleation and deeper suture being further differential characters. Thiele's type could hardly be a mature shell. His figure is slightly enlarged.

With the type of *A. osborni* there is a smaller example in which the whorls of the spire are shorter and more convex. The lip has a maroon submargin, probably indicative of immaturity. As the shell had been extensively injured during growth, its proportions are doubtless abnormal. It agrees with the type specimen in color and sculpture.

The figure of "*Achatina schweinfurthi* var." from Mt. Ruwenzori, given by Smith[1] has more the color pattern of this species than of *A. schweinfurthi.*

This *Achatina* is named in honor of Professor Henry Fairfield Osborn, President of the American Museum, whose steadfast support of the Congo Expedition contributed greatly to its success.

Other Species of *Achatina* Recorded from the Belgian Congo

Achatina balteata Reeve

Achatina balteata Reeve, 1849, Conch. Icon., V, Pl. ii, fig. 7 (type locality: banks of the river Gambia). E. v. Martens, 1882, Jahrb. D. Malak. Ges., IX, p. 245. Pilsbry, 1904, Man. of Conch., (2) XVII, p. 20, Pl. iv, fig. 27. Germain, 1913, Bull. Mus. Hist. Nat. Paris, p. 282; p. 353, fig. 71. C. Bœttger, 1913, Ann. Soc. Malacol. Belgique, XLVII, (1912), p. 94.

Upoto, on the Upper Congo, 20° E. long. (v. Schwerin Coll.), according to C. Bœttger. Germain records it, together with a variety *vidaleti* Germain (*op. cit.*, p. 354) from several places in the French Congo: Pays M'Bagba and M'Baiki in the country of the Lobay River (Upper Ubangi), and Fort Rousset. Von Martens gives it from Chinchoxo (near Landana). Possibly it has been confused with *A. bandeirana* Morelet, which is similar in color.

Achatina glaucina Smith

Achatina glaucina E. A. Smith, 1899, Proc. Zool. Soc. London, p. 590, Pl. xxxiv, figs. 2-3 (type locality: Mt. Zomba, 6000 feet, Nyasaland). Pilsbry, 1904, Man. of Conch., (2) XVII, p. 64, Pl. viii, figs. 19-20. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 26.

Bukama (Bequaert Coll.).

Achatina graueri Thiele

Achatina graueri J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 205, Pl. v, fig. 43.

Type locality: Kwidjwi Island (Schubotz Coll.).

Achatina greyi Da Costa

Achatina greyi Da Costa, 1907, Proc. Malacol. Soc. London, VII, No. 4, p. 226, Pl. xx, fig. 1. Connolly, 1912, Ann. South Afr. Mus., XI, 3, p. 195.

Achatina ovata Da Costa, 1907, Proc. Malacol. Soc. London, VII, No. 4, p. 226, Pl. xx, fig. 2.

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[1] 1909, Trans. Zool. Soc. London, XIX, p. 44, Pl. i, fig. 8.

Achatina subovata Da Costa, 1907, Proc. Malacol. Soc. London, VII, No. 4, p. 227, Pl. xx, fig. 4.

Achatina zebrina Da Costa, 1907, Proc. Malacol. Soc. London, VII, No. 4, p. 227, Pl. xx, fig. 5.

Type locality: watershed between the Lualaba and Lufira Rivers, 10° 30′ S. lat. (Upper Katanga; Grey Coll.).

Connolly, who has seen the types, refers the foregoing names to forms of one variable species; he also records examples from Mashonaland (Salisbury).

Achatina nyikaensis Pilsbry

Achatina fragilis E. A. Smith, 1899, Proc. Zool. Soc. London, p. 591, Pl. xxxv, figs. 3-4 (type locality: Unyika Plateau, 6000-7000 feet, Nyasaland). Pilsbry, 1904, Man. of Conch., (2) XVII, p. 64, Pl. ix, figs. 25-26. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 26 (not *Achatina fragilis* Deshayes).

Achatina nyikaensis Pilsbry, 1909, Man. of Conch., (2) XX, p. 113.

Between Sampwe[1] and Kiambi (Bequaert Coll.).

Achatina obscura Da Costa

Achatina obscura Da Costa, 1907, Proc. Malacol. Soc. London, VII, No. 4, p. 227, Pl. xx, fig. 7.

Type locality: watershed between the Lualaba and Lufira Rivers, 10° 30′ S. lat. (Upper Katanga, Grey Coll.).

Achatina schoutedeni Dautzenberg and Germain

Achatina schoutedeni Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 27, Pl. i, figs. 1 and 2.

Type locality: between Sampwe and Kiambi (Bequaert Coll.).

Achatina stuhlmanni v. Martens

Achatina stuhlmanni E. v. Martens, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 176; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 92, Pl. iv, fig. 9. Pilsbry, 1904, Man. of Conch., (2) XVII, p. 68, Pl. xxxiv, fig. 13 (copy of description and figure).

Type locality: in the Rain Forest west of the Upper Ituri[2] (Stuhlmann Coll.); also recorded by the same collector from a ferry on the Upper Ituri, near Kibilibissi.

Achatina transparens Da Costa

Achatina transparens Da Costa, 1907, Proc. Malacol. Soc. London, VII, No. 4, p. 226, Pl. xx, fig. 3.

Type locality: watershed between the Lualaba and Lufira Rivers, 10° 30′ S. lat. (Upper Katanga; Grey Coll.).

A. schoutedeni Dautzenberg and Germain is apparently a synonym of this species (J. Bequaert).

Achatina virgulata Da Costa

Achatina virgulata Da Costa, 1907, Proc. Malacol. Soc. London, VII, No. 4, p. 227, Pl. xx, fig. 6.

Type locality: watershed between the Lualaba and Lufira Rivers, 10° 30′ S. lat. (Upper Katanga; Grey Coll.).

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[1] Misspelled "Sangwe" by Dautzenberg and Germain, 1914.

[2] This is the region near Kilo.

Achatina wildemani Dautzenberg

Achatina wildemani DAUTZENBERG, 1907, Journ. de Conchyl., LV, p. 329, Pl. v, figs. 7 and 8.

Type locality: Mangay on the Kasai River (Collector ?).

Achatina zebriolata Morelet

Achatina zebriolata MORELET, 1866, Journ. de Conchyl., XIV, p. 158 (type locality: near the river Quiaposa in the district Golungo Alto, Angola); 1868, Voy. Welwitsch, Moll. terr. et fluv., p. 72, Pl. III, fig. 1. E. v. MARTENS, 1882, Jahrb. D. Malak. Ges., IX, p. 246. DAUTZENBERG, 1907, Journ. de Conchyl., LV, p. 330. C. R. BŒTTGER, 1913, Ann. Soc. Malacol. Belgique, XLVII, (1912), p. 93.

Mangay on the Kasai River (Collector?; recorded by Dautzenberg). The species has been found in many localities in Angola: San Antonio, Malange, Quanza River, Malash[1] on the Kasai River. Compare with *A. pfeifferi* Dunker, also from the mouth of the Congo and Angola.

The following species probably occurs within the boundaries of the Belgian Congo:

Achatina ellioti E. A. SMITH, 1895, Proc. Malacol. Soc. London, I, p. 325, fig. 3 (on p. 323). Type locality: near Lake Albert Edward, at 3000-4000 feet (probably in Uganda).

CALLISTOPLEPA Ancey

Callistoplepa ANCEY, 1888, Bull. Soc. Malacol. France, V, p. 69, footnote 2; type: *Achatina shuttleworthiana* = *A. shuttleworthi* Pfeiffer. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 125.

Ganomidos D'AILLY, 1896, Bihang Svenska Vet. Ak. Handl. Stockholm, XXII, 4, No. 2, p. 66; type not designated; for two species of *Achatina*, among them *A. shuttleworthi* Pfeiffer.

Callistopepla ANCEY, 1898, Nautilus, XII, p. 92; type: *A. shuttleworthi* Pfeiffer.

This genus is only known from West Africa (Grand Bassam and Kamerun) and the Congo Basin. The very few recorded localities have been marked on the distribution map of the genus *Achatina* (Fig. 25). No species were taken by the Congo Expedition; but the following have been described from the Belgian Congo.

Callistoplepa fraterculus (Dupuis and Putzeys)

Ganomidos fraterculus DUPUIS AND PUTZEYS, 1900, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXV, p. xiii, fig. 18.

Callistoplepa fraterculus Dupuis and Putzeys. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 129, Pl. XLVII, fig. 23.

Type locality: Island of Mvula, on the Upper Congo (Lualaba) (Dupuis Coll.).

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[1] Malash is the point where Buchner crossed the Kasai in July 1880, at about 9° S. lat. and thus on the border between the Belgian Congo and Angola.

Callistoplepa marteli (Dautzenberg)

Achatina marteli Dautzenberg, 1901, Ann. Soc. Malacol. Belgique, Mém., XXXVI, p. 3, Pl. i, fig. 1 (*Ganomidos marteli* on the plate); and var. *pallescens* Dautzenberg, *op. cit.*, p. 3, Pl. i, fig. 2.

Callistoplepa marteli Dautzenberg. Pilsbry, 1905, Man. of Conch., (2) XVII, p. 129, Pl. xlvii, figs. 21-22.

Type locality of type and variety: region of Lake Tanganyika (Guillemé Coll.); a specimen received from Mr. Dautzenberg is labeled Mpala [J. B.].

Callistoplepa pellucida (Putzeys)

Ganomidos pellucidus Putzeys, 1898, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIII, p. xci, figs. 20-21.

Callistoplepa pellucida Putzeys. Pilsbry, 1905, Man. of Conch., (2) XVII, p. 128, Pl. xliii, figs. 3-4.

Type locality: forest of Piani Kapuri in the Manyema (Dupuis Coll.).

Burtoa Bourguignat

Burtoa Bourguignat, March 1889, Mollusques de l'Afrique Equatoriale, p. 88. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 298.

Burtopsis Bourguignat, March 1889, Mollusques de l'Afrique Equatoriale, p. 98.

Livinhacia Crosse, April 1889, Journ. de Conchyl., XXXVII, p. 107.

While closely related to *Achatina* by its soft anatomy, *Burtoa* differs conspicuously from both *Achatina* and *Limicolaria* by the absence of oblique stripes. There are many local races, about which little is known, most of them not positively identified from other than the type localities. By themselves, the two races from Boswenda and Medje would be thought distinct species.

The anatomy of specimens identified as *B. nilotica* from Bumako Island in Victoria Nyanza, has been well described and figured by Reynell,[1] and Pollonera has figured the genitalia and jaw of a form from west of the same lake, perhaps belonging to the same form of *nilotica*. *B. n. obliqua* dissected by myself (Fig. 34*a* and *b*) differs somewhat from both.

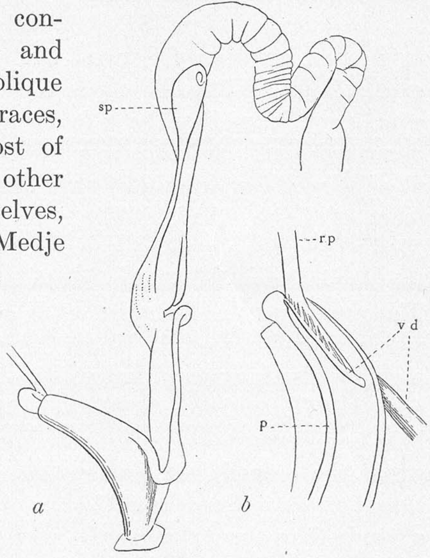

Fig. 34. *a* and *b*, Genitalia of *Burtoa nilotica obliqua* (v. Martens). In *b*, the penis sheath opened: p, penis; rp, penial retractor; sp, spermatheca; vd, vas deferens.

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[1] 1906, Proc. Malacol. Soc. London, VII, No. 3, p. 197, Pl. xvii.

The penis with its enveloping sheath is very stout, 6.5 mm. in diameter. When the sheath is opened, the penis is seen to be slender, enlarging at the distal end, which projects from the sheath as in many *Achatinæ*. The vas deferens penetrates the sheath above the middle, becoming much smaller inside, where fibers and bands of the penial retractor are inserted upon it throughout its length. As noted by Reynell, the penial retractor is inserted distally on the diaphragm.

The vagina is much longer than in the form described by Reynell, who gives the length as 10 to 15 mm. The spermatheca is recurved at the apex in a little oval body about 2 mm. long; but probably this would disappear when the organs became functionally active.

Length of the penis, 24 mm.; of spermatheca and duct, 30 mm., of which the spermatheca occupies about 10 mm.; of the vagina, 33 mm.; of the shell, 107 mm.

It appears likely that Pollonera's dissection of the penis was imperfect, since his Pl. XIX, fig. 7 shows a structure quite unlike what was found by Reynell and myself. The divergence between Reynell's figures and my own is no doubt due to the fact that we dealt with different species or subspecies.

Distribution (Fig. 35).—For a long time this genus was known only from the highlands of Central East Africa, until Dupuis discovered its existence in the Rain Forest of the Upper Congo. In later years, however, some forms have been found much farther westward: Jousseaume described his *B. louisettæ* from the Upper Sanga, and Germain recorded *B. nilotica obliqua* from the "pays M'Bagba" and *B. nilotica* from Kanem (east of Lake Chad). The localities mentioned below—Yakuluku, Medje, and Stanleyville—connect the numerous previous records from the Anglo-Egyptian Sudan south of 10° N. lat. with those from the Manyema and the Katanga. The genus will probably be found in the whole region between the Upper Congo, the Upper Sanga and Lake Chad, possibly also in certain parts of the Kasai drainage. The southernmost record of *Burtoa* is on the banks of the Amanze Inyama River in Matabele Land, about 22° S. lat. In East Africa these large snails seem to avoid the coastal belt where *Achatina* is very abundant.[1] Along the slopes of the mountains of Central Africa *Burtoa* reaches a much higher altitude than the *Achatinæ*: *B. nilotica emini* (v. Martens) was collected by Bequaert at 1800 m. in the volcano region north of Lake Kivu.

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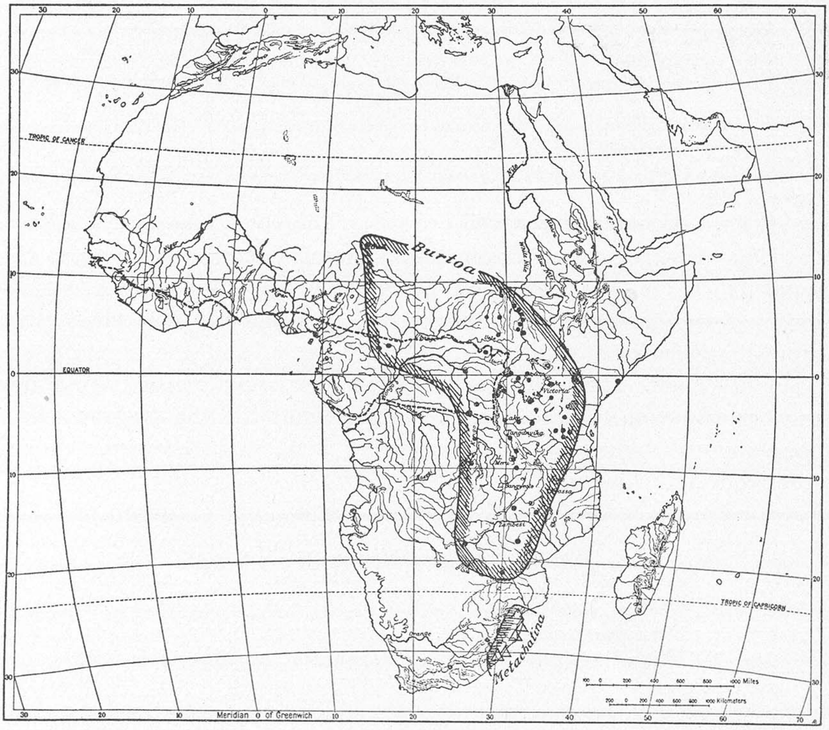
[1] The following record is the only one for *Burtoa nilotica* on the East Coast and seems to me very doubtful; it is probable that the specimens in question were brought from the back country: "Mr. Preston informs me that he has taken it at Kismayu" (Jane Longstaff, 1914, Journ. Linn. Soc. London, Zool., p. 250).

The range of *Metachatina* Pilsbry is also shown on the map. Though similar in shell characters to *Burtoa*, this genus is probably a parallel evolution product from a different group of *Achatinæ*. It is found in a small area only on the eastern coast of South Africa. Germain and de Rochebrune[1] have recorded *Metachatina kraussi* (Pfeiffer) from "Ambati, pays de Soddo, 2280 m.," a place somewhere in southern Abyssinia; but there can be little doubt that this record is erroneous.



Burtoa
Metachatina
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
Meridian 0 of Greenwich
Nile
Victoria
Tanganyika
Zambezi
Orange
Miles
Kilometers
30
20
10
0
10
20
30
40
50
60
70

Fig. 35. Distribution of *Burtoa*, locality records shown by dots; and of *Metachatina*, locality records shown by triangles.

"Though *Burtoa* crawls about singly in the forest trails, it is rarely seen on plantations and apparently does not climb trees like *Achatina*. I was surprised to hear that in Yakuluku, near the border of the Sudan, it occurs in such numbers that the officials had the natives collect these heavy shells to make lime for whitewashing their homes. It is not eaten by the natives of the Ituri Forest, who believe it responsible for certain diseases" [H. L.].

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[1] 1904, Mém. Soc. Zool. France, XVII, p. 12.

Burtoa nilotica (Pfeiffer)

Bulimus niloticus PFEIFFER, 1861, Proc. Zool. Soc. London, p. 24; type locality: sources of the White Nile.

Burtoa nilotica Pfeiffer. BOURGUIGNAT, 1889, Moll. Afr. Equator., p. 89. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 300, Pl. XXVII, fig. 5. A. REYNELL, 1906, Proc. Malacol. Soc. London, VII, No. 3, pp. 197-200, Pl. XVII (anatomy). E. A. SMITH, 1909, Trans. Zool. Soc. London, XIX, p. 45. POLLONERA, 1909, Il Ruwenzori, Parte Scientif., I, p. 197, Pl. XIX, figs. 6-8; Pl. XX, fig. 21 (var. *minor* Pollonera). J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 204. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 30.

Livinhacia nilotica Pfeiffer. CROSSE, 1889, Journ. de Conchyl., XXXVII, p. 109.

Limicolaria (*Livinhacia*) *nilotica* Pfeiffer. E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 94.

Mt. Ruwenzori (Wollaston Coll.), and on the eastern slopes (Ibanda and Bihunga, Duke of Abruzzi Coll.). At the foot of Mt. Muhavura and on the Island Wau (Schubotz Coll.). Bukama (Bequaert Coll.).

The specimen from Bukama is expressly stated to belong to the typical form; but part of the above records probably pertain to subspecific forms of this variable species. It may be doubted whether quite typical *nilotica* occurs in southwestern Uganda and the northeastern Belgian Congo. Three forms which are certainly distinct from one another and from typical *nilotica* are represented in the present collection; and to obviate any question as to just what they are, two are described and figured.

22. **Burtoa nilotica obliqua** (v. Martens)

Plate XII, Figures 1 and 2

Limicolaria nilotica var. *obliqua* E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 181 (type locality not designated; described from Usagara and the eastern side of Lake Tanganyika); 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 97, fig. on p. 96.

Burtoa nilotica var. *obliqua* v. Martens. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 303, Pl. XXX, fig. 18. GERMAIN, 1913, Bull. Mus. Hist. Nat. Paris, p. 285. C. R. BŒTTGER, 1913, Ann. Soc. Malacol. Belgique, XLVII, (1912), p. 94. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 32.

Reported from the Upper Congo by C. R. Bœttger (Baumann Coll.). Near Ankoro (Bequaert Coll.). Germain records this form from the "pays M'Bagba" (on the Lobay River, west of the Ubangi). See under *B. n. louisettæ.*

Stanleyville, 6 specimens; and Medje, 12 examples (Lang and Chapin Coll.).

The color was not mentioned by von Martens. These specimens are much darker than the typical *B. nilotica.* Where unworn, on the back of the last whorl, the shell is copiously streaked with black on a claret-brown ground, or sometimes almost wholly black. On the worn ventral side the ground is cinnamon, varying in tint, and the dark streaks are mainly worn off.

Length	*Diameter*	*Length of Aperture*
119 mm.	77 mm.	74 mm.
110	72	71

A young one about 50 mm. long has the first half whorl slightly sunken. About two and a half whorls are smooth, then granulation appears gradually; the limit of nepionic and neanic stages is not distinctly marked.

The race appears to be mainly distinguished by the rapid increase of the whorls, the last one inflated at and below the periphery, giving the shell an obliquely lengthened contour, and making the aperture noticeably wider than in *B. n. schweinfurthi.* Large ones have six and a half whorls. The genital system is described above.

"The specimens which I collected in the Katanga (October 1911) were estivating in the soil; they had buried themselves in termite hills; some of them were adult, others young; but all had closed the entrance of the shell with a solid, milky-white, calcareous epiphragm. These snails were dug out and brought to me in large numbers by the natives at the villages of Kibao and Musompe along the Lualaba-Congo, south of Ankoro" [J. B.].

23. **Burtoa nilotica emini** (v. Martens)

Plate V, Figures 1 and 1*a*

Limicolaria nilotica var. *emini* E. v. MARTENS, 1891, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 14; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 94, fig. on p. 96.
Burtoa nilotica var. *emini* v. Martens. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 301, Pl. XXIX, fig. 7.

This form was described from Bukoba and Ipala (Ugogo) in German East Africa, but the type locality was not designated.

Boswenda, at about 1800 m., on short grass steppe; 4 specimens (Bequaert Coll.).

The shell is perforate, ovate, rather thin but strong, cinnamon, partly covered with a thin ochraceous-tawny cuticle, streaked with chestnut brown. Sculpture of small, unequal folds, cut into low oblong granules by weakly impressed spiral lines. Whorls more convex than in *B. n. obliqua.* The aperture is vertical, pale blue (or light pinkish cinnamon) within, but with a submarginal border of deep vinaceous, the same hue coloring the columella and parietal callus. The outer lip is slightly retracted near its upper insertion.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
90 mm.	52 mm.	48 mm.	6⅔
90	54	50	
87	53	48	
85	51	48	

This subspecies has noticeably more convex whorls and a less obtuse apex than other forms of *B. nilotica* which I have been able to compare. In figure it is perhaps most like *B. jouberti* (Bourguignat),[1] from German East Africa.

A description and figures of the Boswenda form have been given, as it does not agree exactly with *emini*, the spire being a little longer. It is somewhat intermediate between *emini* and *oblonga* v. Martens in this respect.

Perhaps Pollonera's var. *minor* is identical with *emini*, but it is a still smaller shell.

"Numerous specimens of a tachinid fly belonging to the genus *Mydæa* hatched from one of these snails which was found dead. This fly is, according to J. Villeneuve, either *M. bivittata* (Macquart) or a closely allied species. Whether it is a true parasite or a scavenger could not be ascertained; the former is, however, more likely" [J. B.].

24. **Burtoa nilotica schweinfurthi** v. Martens

Achatina nilotica Pfeiffer. E. v. Martens, 1870, Malak. Blätter, p. 32.

Limicoloria nilotica Pfeiffer (in part), 1870, Novit. Conch., IV, p. 5, Pl. cx, figs. 1, 3

Limicolaria nilotica var. *schweinfurthi* v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 95.

Burtoa nilotica var. *schweinfurthi* v. Martens. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 300 (exclusive of synonym *B. pethericki* Bourguignat).

Type locality: region of the Rek and Djur, tributaries of the Bahr-el-Ghazal, the Sheriba Ghattas mentioned as a definite locality (Schweinfurth Coll.).

Yakuluku, on the watershed between the Uele and Nile drainages (Lang and Chapin Coll.).

All of the above references relate to the same specimens taken by G. Schweinfurth and illustrated by Pfeiffer. The specimens taken by

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[1] *Burtopsis jouberti* Bourguignat, 1889, Moll. Afr. Equat., p. 99, Pl II, fig. 1.

Lang and Chapin appear to be quite typical except in being slightly smaller. There is an immature shell, however, which would evidently have grown larger than the adults collected, two of which measure:

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
93.0 mm.	58 mm.	60.3 mm.	6½
101.5	65	62.3	6½

Von Martens considered *Burtoa pethericki* Bourguignat to be identical with his own variety *schweinfurthi* for the reason that Bourguignat cited Pfeiffer's figure of a young example as representing *B. pethericki.* I formerly followed the same course, but on reconsideration that decision is withdrawn because Bourguignat gave also a description of his *B. pethericki,* apparently from specimens and not merely from Pfeiffer's figure. He stated that it came from certain places mentioned in the "contrée voisine du Nyanza Oukéréwé"—that is, the Victoria Nyanza. It is obvious that he did not have the northern form represented by the figure in question, but another race from the country south of Lake Victoria, to which the name *pethericki* will be restricted if the race proves to be valid.

That the form was named after Petherick was apparently due to some confusion in Bourguignat's mind as to who collected the shell figured by Pfeiffer, though the facts had been stated clearly enough.

Other Subspecies of *Burtoa nilotica* Recorded from the Belgian and French Congo

Burtoa nilotica dupuisi (Putzeys)

Livinhacia dupuisi Putzeys, 1898, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIII, p. lxxxii, fig. 1.

Burtoa dupuisi Putzeys. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 306, Pl. xxiii, fig. 47 (copy of original description and figure).

Burtoa nilotica var. *dupuisi* Putzeys. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 31.

Forest of Micici in the Manyema (type locality; Dupuis Coll.). Kibombo (Bequaert Coll.).

Burtoa nilotica louisettæ (Jousseaume)

Burtoa louisettæ Jousseaume, 1911, Bull. Soc. Zool. France, XXXVI, p. 94, fig. (type locality: Upper Sanga, French Congo).

There is very little in the description and figure of this form to distinguish it from *B. n. schweinfurthi;* yet, as the locality is remote, in fact at the western limit of *Burtoa* as now known, it may be as well to allow *louisettæ* to stand until actual comparison of specimens can be made.

Probably the race reported by Germain from the "Pays M'Bagba," on the Lobay River, under the name var. *obliqua* v. Martens, is identical with *louisettæ*, since it is from a neighboring locality, and remote from the known range of *obliqua*.

LIMICOLARIOPSIS d'Ailly

Limicolariopsis D'AILLY, 1910, Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro, I, 6, p. 24.

Rebmanniella PRESTON, 1911, Ann. Mag. Nat. Hist., (8) VII, p. 471.

The group *Limicolariopsis* d'Ailly, type *L. sjöstedti* d'Ailly, appears to be a valid genus, distinguished by the sculptured embryonic shell including part of the first whorl, and the large eggs, few in number. There are several species described as *Limicolariæ* which have a similar large summit, of which at least one, *L. donaldsoni*, has the first whorl smooth, decussation beginning very feebly on the second. Probably these forms have not the other characters of *Limicolariopsis*. *Rebmanniella* Preston, type *Limicolaria* (*R.*) *inepta* Preston, appears to be a synonym of *Limicolariopsis*.

Mt. Ruwenzori will probably prove to be the western limit of the genus. The other species are from much farther east.

Limicolariopsis now contains the following species:

L. dohertyi (E. A. Smith) = *Limicolaria dohertyi* E. A. SMITH, 1901, Journ. of Malacol., VIII, p. 95, fig. 4. Escarpment station of the Uganda Railway, British East Africa, at 6500-9000 feet.

L. inepta (Preston) = *Limicolaria* (*Rebmanniella*) *inepta* PRESTON, 1911, Ann. Mag. Nat. Hist., (8) VII, p. 471, Pl. XII, fig. 24. Mt. Kenia, at 6000-8000 feet.

L. keniana (E. A. Smith) = *Limicolaria keniana* E. A. SMITH, 1903, Quart. Journ. of Conch., X, p. 318, Pl. IV, fig. 17. Mt. Kenia.

L. perobtusa (Preston) = *Limicolaria* (*Rebmanniella*) *perobtusa* PRESTON, 1912, Proc. Malacol. Soc. London, X, p. 111, fig. Mt. Kenangop, Aberdare Range.

L. percurta (Preston) = *Limicolaria* (*Rebmanniella*) *percurta* PRESTON, 1912, Proc. Malacol. Soc. London, X, p. 110, fig. Between the Igembi Hills and Nyeri, British East Africa.

L. sjöstedti D'AILLY, 1910, Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro, I, 6, p. 24, Pl. I, figs. 31-36. Mt. Meru, at 3000-3500 m.; Mt. Kilimanjaro, at 2000-2500 m.

25. **Limicolariopsis ruwenzoriensis,** new species

Plate III, Figures 1, 2, 5, and 6

Mt. Ruwenzori, western slope, lower mountain forest in the valley of the Lanuri, at about 2000 m.; 10 specimens (Bequaert Coll.).

The shell is imperforate, rather solid, oblong-conic, with convex lateral outlines and obtuse, rounded summit. The early whorls are dark vinaceous (but the tone varies individually), last two and a half whorls naples yellow with irregular stripes of chestnut brown. The early whorls are worn, but the last three have a clean-cut, *Achatina*-like sculpture of fine, irregular axial wrinkles cut into granules by shallower spiral lines (Fig. 36); this sculpture abruptly becomes very much weaker at the periphery of the last whorl. The whorls are moderately convex, the suture at first shallow, becoming deeply impressed and minutely crenulate. The aperture is bluish white within, with some dark streaks in the throat. The columella is straight, faintly violaceous above.

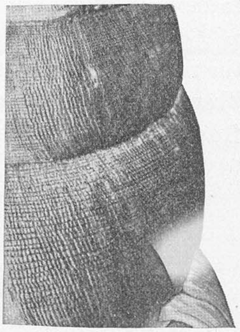

Fig. 36. *Limicolariopsis ruwenzoriensis*, new species. Enlarged view of surface from photograph (not retouched).

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
53.0 mm.	23 mm.	22.5 mm.	6½	Type
53.0	22	22.3	6½	
47.5	22	22.5	6	

The oblong shell, dome-like summit, and achatinoid decussation give the species a marked individuality. One is reminded of the small forms of *Thaumastus*.

There is wide individual variation in the dark markings, which may be narrow, or so wide as to largely replace the ground tint. In some shells they are carob brown. In one immature example there are unequal streaks following the direction of growth-lines, but usually there is more or less undulation or zigzag marking, as is usual in *Limicolaria*. About half of the lot have an extensive suffusion or speckling of naples yellow (or slightly brighter) over the dark markings, which then show faintly through, or are in part extinguished, as in Pl. III, fig. 6.

This species evidently stands very near *Limicolariopsis sjöstedti* d'Ailly,[1] from Mt. Meru and Mt. Kilimanjaro. The columella of that species is described as "supra in plicam validam, cylindraceam tortuosa"—terms not applicable to *L. ruwenzoriensis*. *Limicolaria* (*Rebmanniella*)

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[1] 1910, Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro, I, 6, p. 24.

perobtusa Preston[1] from Mt. Kenangop, in the Aberdare Range, is also similar, but differs by being rimate and of broader contour. Possibly we have to do with a widely distributed species; yet as the snails appear to be mountain forms (*L. sjöstedti* at 2000 to 3500 m., *L. ruwenzoriensis* at 2000 m.), and the locality of my species lies about 500 miles west from the recorded ranges of its allies, it seems more likely that there are several "representative" species; a view also supported by the fact that the Ruwenzori snail does not agree fully with the descriptions given of the eastern forms.

An egg found with the specimens had apparently fallen out of one of them. It is broken and discolored, but seems to have been nearly white, oval, 5 × 7 mm. Its shell had a smooth, dense surface.

LIMICOLARIA Schumacher

Limicolaria Schumacher, 1817, Essai d'un Nouv. Syst. Vers Test., pp. 61 and 300.

Distribution (Fig. 37).—This genus is restricted to tropical Africa, but its range differs slightly from that of *Achatina*.[2] It extends much farther north than the latter, the limit being at about 15° to 16° N. lat.: from the mouth of the Senegal across the bend of the Niger, Damergu, Lake Chad, Kordofan, and Sennar. The Quanza River in Angola and the Upper Kafue (Kopopo in North Rhodesia, at 14° S. lat.) seem to be the southernmost records. It is abundant along the entire coast of Guinea and has been reported from Fernando Po, where its existence is perhaps traceable to importation in food plants. Though common throughout Abyssinia and the interior of British and German East Africa, the *Limicolariæ* apparently avoid the East African coastal belt; at least there is no definite record of their occurrence there,[3] the localities nearest the coast being Keren (Bogos country) and Habrawal in Abyssinia, and Voi in British East Africa. In the mountains of Abyssinia and Equatorial Africa *Limicolaria* ascends much higher than either *Achatina* or *Burtoa*, though at high altitudes it is partly replaced by the truly montane *Limicolariopsis*. Sjöstedt collected a living *Limicolaria*

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[1] 1912, Proc. Malacol. Soc. London, X, p. 111.

[2] It will be seen that our map differs entirely from the very diagrammatic one published by Germain [1909, Arch. Zool. Gén. Expér., (5) I, p. 89, fig. 49]; this is true also of his maps of *Achatina*, *Burtoa*, African Helicidæ, African land operculates, etc.

[3] *Limicolaria sculpturata* Ancey was found in sacks of grain from the northern part of Mozambique, a record too vague to be used in a study of distribution; besides this species may not be a true *Limicolaria*.

turriformis at 3000-3500 m. on Mt. Meru. *L. saturata* was found by Schubotz on the Kivu volcanoes at 3000 m. and is fairly abundant on Mt. Ruwenzori between 1800 and 2500 m.

"These snails inhabit the savannah country as well as the forest and, wherever they occur, they are usually found in large numbers. Along the banks of the Congo River near the equator, hundreds of specimens of various ages can be found on open places in the humid grass; they are also abundant in the banana fields. Outside the forest they burrow in the soil to estivate and close their shells with a white epiphragm, similar to that of *Achatina*, but thinner" [J. B.].

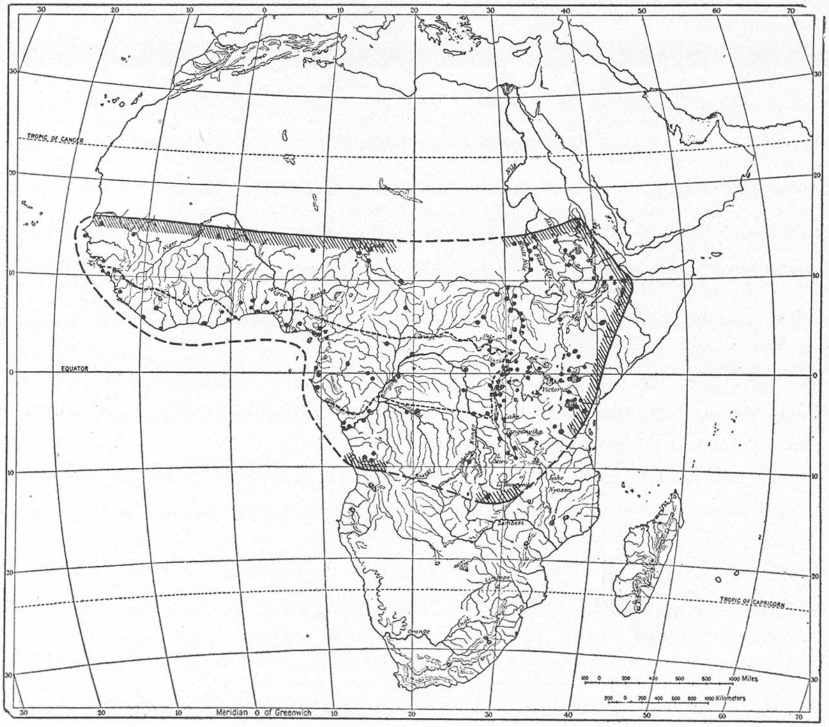
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
Nile
Niger
Victoria
Tanganyika
Nyasa
Zambesi
Limpopo
Orange
Meridian 0 of Greenwich
Miles
Kilometers

Fig. 37. Distribution of *Limicolaria*; locality records shown by dots.

In 1904, when the last monograph was published,[1] some seventy-two species were recognized. More than half that many have been described since. While some species are recognizable over a wide territory, others appear to have many local modifications. Single colonies frequently contain two or more pattern or shape mutations, which are not readily recognizable as the same species without a large series of specimens and an appreciation of the extent of the variation commonly encountered in the genus.[1] Such mutations have often been named as distinct species or as "varieties"—a non-committal term, covering any departure from the normal. The same pattern mutations may occur in several species. These idiosyncracies of the *Limicolariæ* lead to a certain distrust of the identifications made by others, and surely should prevent dogmatism in one's own results.

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[1] Man. of Conch., (2) XVI, p. 246.

Limicolaria subconica v. Martens

Limicolaria numidica Reeve var. *subconica* E. v. Martens, 1882, Jahrb. D. Malak. Ges., IX, p. 246 (type locality: Chinchoxo near Landana).

Limicolaria subconica E. v. Martens, 1885, Conch. Mittheil., I, p. 188, Pl. xxxiv, figs. 3, 4. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 264, Pl. xxi, figs. 26, 27 (copy of description and figures).

Limicolaria droueti Morelet, 1885, Journ. de Conchyl., XXXIII, p. 21, Pl. ii, fig. 14 (type locality: Toumby[2] near Landana).

This species has not been reported in its typical form from Belgian territory, where it is represented by the following form, allowed subspecific standing with some doubt.

L. prætexta v. Martens,[3] from Kamerun, is a larger species, typically having more copious markings.

26. **Limicolaria subconica germaini** (C. Bœttger)

Plate IV, Figures 1, 2, and 3

Perideriopsis fallsensis Dupuis and Putzeys var. *germaini* C. R. Bœttger, 1913, Ann. Soc. Malacol. Belgique, XLVII (1912), p. 95, Pl. ii, fig. 1 (type locality: Banana); and var. *unicolor* C. R. Bœttger, 1913, *op. cit.*, p. 96, Pl. ii, fig. 2 (type locality: Mascaia Massurungo,[4] on a side-branch of the Banana Creek).

Moanda, 20 specimens (Lang and Chapin Coll.). Zambi, 5 specimens (Bequaert Coll.) and 16 immature specimens (Lang and Chapin Coll.).

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[1] W. Kobelt has feelingly alluded to the difficulty of *Limicolaria*, 1910, Abhandl. Senckenberg. Nat. Ges., xxxii, p. 20, and 1913, Revue Suisse de Zoologie, XXI, p. 60.

[2] This locality is the N'Tumbo of the official "Carta dos Territorios de Cabinda e Malembo" published in Lisbon, 1904.

[3] 1888, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 148; Conch. Mittheil., III, p. 8, Pl. xliii, figs. 4, 5.

[4] This locality is probably the one marked Makaya on our map of the Lower Congo.

The shell is openly perforate, conic, thin, with but little gloss when unworn. Cinnamon-rufous, paler below the suture, marked with zigzag, chestnut-brown stripes which are widest in the middle and become slender or branch in the paler subsutural zone; the first two and a half whorls being uniform hazel. The embryonic shell is rather large, mammillar, with obtuse summit. The first half whorl is nearly smooth, then impressed spiral lines appear. The second whorl has close, fine, irregularly vertical striæ which are cut into long, unequal granules by the spirals. This sculpture gradually weakens and has disappeared by the middle of the third whorl, where the neanic stage appears to begin, and the sculpture, for nearly a whorl, consists of irregular fine wrinkles of growth. After that, very fine, close, impressed spiral lines appear, the surface being very minutely granular. These spirals become weaker and disappear on the penult whorl, leaving the last whorl marked with low growth-wrinkles only. The whorls are convex, the suture scarcely crenulated, marked with a pale line, very narrowly dark-bordered below. The aperture is oblique, ovate, dark vinaceous purplish within. The columella is nearly straight above, somewhat concave below. Outer lip thin.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
37.6 mm.	16.5 mm.	14.4 mm.	8	Moanda
34.0	15.0	14.0	7¾	Moanda
39.8	16.0	15.7	8¼	Zambi

C. Bœttger described this as a variety of *Perideriopsis fallsensis*, but a comparison of specimens shows that it is certainly quite distinct from that snail of the Upper Congo. The generic reference, however, is quite excusable. By its slightly bulbous summit and dark color the shell has a resemblance to *Perideriopsis* and *Pseudotrochus*. The perforate columellar axis is common to *Perideriopsis* and *Limicolaria*. A comparison with specimens of several species shows that the texture and pattern (especially in specimens with light ground tint) are essentially like the West African *Limicolariæ*, and less like *Perideriopsis*.

It appears to be closely related to the form described as *Limicolaria droueti* Morelet from a neighboring locality, Toumby near Landana, and I believe that the Landana and Congo mouth forms are specifically identical. *L. droueti*, however, is described as smaller (though the diameter assigned, 8 mm., is obviously an error). Probably the type was immature. As figured the apex is not enlarged, and the columella is described as *plicata, flexuosa*,—terms hardly applicable to the specimens in hand. *L. luctuosa* Pfeiffer has a decidedly wider spire. *L. subconica* v. Martens is marked somewhat differently, yet I strongly suspect that when a sufficient series is obtained it will be found to run into the *germaini* patterns. Until new collections are made in the Chinchoxo-Landana neighborhood, my belief that *L. droueti*, *L. subconica*, and *P. f. germaini* are merely varying forms of one species cannot be verified. Meantime, I use the subspecific formula.

Throughout the neanic stage the periphery is conspicuously angular and a trace of the angle persists upon the front of the last whorl in some adults. The prevalent form at Moanda, described above and illustrated by Pl. IV, fig. 1, has a darker ground-color than Bœttger's type, and the markings, though in the same pattern, are less bold. Of this pattern there are twelve specimens in the lot. Another mutation (eleven specimens) has a carob-brown ground with a subsutural zone of dull tawny-olive, without markings or sometimes they are faintly visible as darker stripes (Pl. IV, fig. 3).

Bœttger's type is described as having yellowish white ground, a belt of broad chestnut-brown spots with fine streaks of the same color above and below it. A few immature specimens from Moanda (Pl. IV, fig. 2) have this pattern. The ground is cartridge-buff or paler, the stripes and the tip of the spire chestnut-brown.

Bœttger's var. *unicolor* appears to be a mutation of this light form, in which stripes are absent, as in the similarly unmarked mutation of the dark form. In his description of *L. subconica*, v. Martens mentioned a unicolored form.

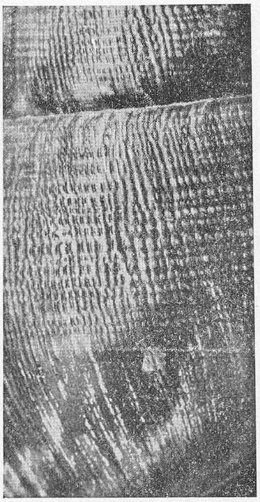

Fig. 38. *Limicolaria walkeri*, new species. Enlarged view of surface of last and part of penult whorl, showing sculpture.

27. **Limicolaria walkeri**, new species

Plate XIII, Figures 1 and 1 *b*

Mobeka, 9 specimens (Lang and Chapin Coll.).

"On arriving at Mobeka in the late afternoon, we saw no shells, but in the early morning, after the heavy rain of the night, they were crawling over the short grass in numbers. We collected about a hundred in a few minutes, all much alike in pattern; unfortunately we saved only a few" [H. L.].

The shell is thin, narrowly umbilicate, ground-color naples yellow with a suggestion of olive-lake, the base marked with broad stripes of russet or cinnamon-brown; these extend slightly above the periphery, and are visible as spots, chiefly triangular, above the suture; the surface above them having numerous inconspicuous narrow streaks. The form is oblong-conic, the outlines of the spire a trifle contracted near the summit, elsewhere slightly convex; the whorls are weakly convex, the last whorl rather full below. About 3 whorls at the summit are smooth, the following whorls being granulous, the granules long, in spiral series, produced by the interruption of close, slightly irregular vertical folds (Fig. 38). At the periphery these folds weaken and the granulation becomes low, irregular and relatively inconspicuous, the base being smoother and more glossy. The aperture is long-ovate. The outer lip is thin, the columella very slightly twisted, with reflected and somewhat recurved edge; of pale vinaceous drab color.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
62.0 mm.	25.0 mm.	26.5 mm.	9	Type; Pl. XIII, fig. 1*b*
52.5	24.5	25.0	8½	Pl. XIII, fig. 1
50.5	22.0	22.3	8⅓	Mut. *nudata;* Pl. XIII, fig. 1*a*
51.3	21.0	21.8	8½	Mut. *nudata*

This species appears to be related to *L. turriformis* v. Martens,[1] and its variety *solida* v. Martens,[1] from Entebbe and other places from the southwestern to the northern shores of Lake Victoria. The present species has a somewhat shorter, less strictly conic spire, which is perceptibly fuller in the lower part, and the color pattern is different. Pollonera has described a var. *elongata*[2] of *L. turriformis,* characterized by tawny-reddish or chestnut-blackish flammules, found in the Mobuku Valley and eastward in Uganda. No dimensions or figure are given, but it is said to be similar to *L. t. neumanni,* which differs decidedly from *L. walkeri* in shape. Var. *ugandensis* Pollonera is a more obese shell, similarly marked. The several forms of *L. turriformis* are all geographically remote from the locality of *L. walkeri,* Mobeka being on the Middle Congo not far from Nouvelle Anvers.

It is named for Dr. Bryant Walker, who has done good work on the African Ancylidæ.

Mutation **nudata**

Pl. XIII, fig. 1*a*, represents the mutation **nudata,** in which dark markings are absent, and the shell is somewhat smaller, at least in those seen. It has the tenuity and sculpture of the typically colored form. Three of the nine specimens taken at Mobeka are of this mutation.

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[1] *Limicolaria turriformis* E. von Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 181; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 102, Pl. IV, fig. 11.

[2] 1909, Il Ruwenzori, Parte Scientif., I, p. 198.

28. **Limicolaria lucalana** Pilsbry

Plate VI, Figure 12

Bulimus (*Limicolaria*) *jaspideus* A. Morelet, 1866, Journ. de Conchyl., XIV, p. 155 (type locality: on the banks of the Lucala River in the district Ambaca, Angola); 1868, Voy. Welwitsch, Moll. terr. et fluv., p. 62, Pl. ii, fig. 1 (not *Bulimus jaspideus* Morelet, 1863).

Limicolaria lucalana Pilsbry, 1904, Man. of Conch., (2) XVI, p. 262, Pl. xxix, figs. 9-11.

Limicolaria jaspidea Morelet. Germain, 1907, Bull. Mus. Hist. Nat. Paris, p. 426; 1911, *op. cit.*, p. 223; 1913, *op. cit.*, p. 285 and var. *poutrini* Germain, p. 286; also p. 356. Dautzenberg, 1907, Journ. de Conchyl., LV, p. 330.

Dautzenberg records this species from Mangay (Coll.?). Germain (1913) gives it from Irebu (misspelled Trebou) and Bikoro, on the shores of Lake Tumba; also from several localities in the French Congo: Brazzaville, basin of the Ivindo River, Fort Rousset, M'Baiki on the Lobay River.

Near Bolengi, 33 specimens; and near Nouvelle Anvers, 1 specimen (Lang and Chapin Coll.).

The lot from near Bolengi includes three mutations. In all, the ground-tint is naples yellow or slightly paler, and there is a narrow chestnut brown area bordering the perforation. When quite unrubbed, the surface is matt. Markings as follows:

a. Broadly striped with chestnut-brown, similar to the right-hand figure of Morelet's Pl. ii, fig. 2 (1868, Voy. Welwitsch, Moll. terr. et fluv.): 6 specimens; in one the stripes are quite pale.

b. Stripes reduced to lines (Pl. VI, fig. 12): 17 examples.

c. Without dark markings other than the umbilical border. This mutation is what Germain has named var. *poutrini;* 10 examples.

The contour varies a great deal, independent of pattern.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
42.0 mm.	17.3 mm.	17.3 mm.	8	Bolengi
41.3	15.5	15.7	8⅓	"
38.0	15.7	15.0	7½	"
35.0	16.5	15.7	7⅓	"
48.5	17.7	18.4	8⅓	Nouvelle Anvers

The single example from Nouvelle Anvers is of the broad-striped pattern, and unusually slender. It had, however, been broken in the seventh whorl.

29. **Limicolaria distincta** Putzeys

Plate XVI, Figures 1 to 6

Limicolaria distincta Putzeys, 1898, Ann. Soc. Malac. Belgique, Bull. Séances, XXXIII, p. v, fig. 3.

Bena Bendi (type locality, Dupuis Coll.).

Stanleyville, over 100 examples (Lang and Chapin Coll.).

"Numerous specimens of this species were crawling during rainy days over the short grass on the former rubber plantation just north of Stanleyville. The relative constancy of the fine lines was remarkable, compared with the great variety of patterns and shades of *Perideriopsis fallsensis* Dupuis and Putzeys occurring in the plantain gardens in that locality" [H. L.].

These specimens agree well with Putzeys' account and outline figure of *L. distincta*, which came from a place far to the southwest; yet, as the pattern of that was not represented, the identification is not positive.

The shells are perforate, smooth, matt (or sometimes glossy in front of the aperture, where the "bloom" is worn off). The streaks are blackish chocolate on a ground of cartridge-buff to cream-buff. The patterns and shape variation are sufficiently shown by the figures. The pattern shown in Pl. XVI, fig. 1, is found in about ten per cent of the lot. Pl. XVI, figs. 2-6 represent the prevalent patterns.

The allied *L. martensiana* Smith, in various color mutations, has been found on the Upper Congo (Lualaba).[1] The specimens of *L. martensiana* which I have seen are quite glossy throughout.

Limicolaria læta Thiele

Limicolaria læta J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 204, Pl. v, fig. 42.
Type locality: Beni (Schubotz Coll.).

30. **Limicolaria læta medjensis,** new subspecies

Plate XVI, Figures 7 to 12

Medje, 28 specimens (Lang and Chapin Coll.).

The shell is minutely perforate or closed, long and slender, moderately strong, nearly smooth except below the suture where it is distinctly puckered. Cream-color, shading into naples yellow on the last half of the last whorl, closely lineolate with chestnut brown, a few wider streaks at irregular intervals; having a girdle of chestnut spots at the periphery, and a small dark border around the perforation. The spire tapers straightly. The whorls are weakly convex; suture weakly impressed. The aperture is small, oblique, ovate. The columella is rather strongly twisted spirally, vinaceous.

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[1] Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 32.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
43.0 mm.	14.5 mm.	15.0 mm.	8⅓	Type
41.0	13.3	13.5	8¼	
41.0	14.6	15.0	8	
39.4	15.0	15.3	7½	Wide form
38.0	14.5	14.0	8	Wide form

Distinguished by its narrow contour and relatively flat whorls. The very narrow umbilical fissure is sometimes closed.

Besides the mutation selected as typical, there is a less abundant pattern, the shell with broad stripes in the familiar *Limicolaria* manner. There are also individuals combining both patterns on different parts of the shell.

Irrespective of pattern, the specimens may be assorted into a more slender (typical) and a stouter lot, the latter represented by Pl. XVI, figs. 7 and 11, having the whorls noticeably flatter than the slender shells. They form about twenty-five per cent of the whole, there being nine of the stouter shells to twenty-eight of the slender. As I can find no difference in pattern or sculpture, I presume that it is a case where two form mutations exist in the same colony.

In some specimens very sparse and indistinct traces of granulation are visible in places on intermediate whorls of the spire.

Limicolaria lœta Thiele,[1] from Beni, west of Mt. Ruwenzori, resembles certain forms of this race, which will probably take subspecific rank. *L. lœta*, however, is larger and more slender. Thiele believes it to be doubtfully distinct from *L. pura* Pollonera (=*L. smithi* Preston, *L. prestoni* C. Bœttger) which differs from *medjensis* by its stouter figure, the outlines of the spire convex.

31. **Limicolaria saturata** Smith

Plate I, Figures 1, 2, and 5

Limicolaria saturata E. A. Smith, 1895, Proc. Malacol. Soc. London, I, p. 323, fig. 1 (type locality: region of Lake Albert Edward, at 3000-4000 feet); 1909, Trans. Zool. Soc. London, XIX, p. 45, Pl. i, figs. 1-4. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 286, Pl. xxxii, fig. 13. J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 203.

Limicolaria colorata E. Smith. E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 105.[2]

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[1] 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-1908), III, p. 204, Pl. v, fig. 42.

[2] Von Martens' reference of "*L. colorata* Smith" applies to *L. saturata;* so far as I can learn, no *L. colorata* was described by E. A. Smith.

Limicolaria alluaudi GERMAIN, 1909, Bull. Mus. Hist. Nat. Paris, p. 378 (type locality: Mt. Ruwenzori, eastern slope in the forest zone).

This snail, with its numerous subspecies and mutations, is the common *Limicolaria* in the lower mountain forest or culture zone in the high lands of the Lake region, between 1000 and 3000 m.

The typical form was originally described from specimens collected near Lake Albert Edward by Scott-Elliot, probably in Uganda territory. It was recorded from the eastern slopes of Mt. Ruwenzori (Alluaud and Wollaston Coll.), and from the western slope of the same mountain range in the Butagu Valley between 1800 and 3000 m. (Schubotz Coll.). Also from Mt. Sabinyo, at 3000 m.; Mt. Karisimbi, at 2400 m.; Mt. Ninagongo, at 3000 m.; on the islands Kwidjwi and Wau; in the Bugoie Forest at 2500 m. and the Rugege Forest at 1800 m. (Schubotz Coll.). Volkens is said to have found it on Mt. Kilimanjaro between 1200 and 1700 m., a somewhat anomalous record.

Mt. Ruwenzori: common on the western slope in the lower mountain forest between 1500 and 2500 m.; Lanuri Valley, at 2000 m., 6 specimens; Butagu Valley, 2000 to 2300 m., 16 specimens and also at 1500 m., 3 specimens (Bequaert Coll.).

Specimens from the first locality (Lanuri) agree well with Smith's description and figures, but they are smaller.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
55 mm.	21.3 mm.	21 mm.	8
58	22.	21	8

The whorls are well rounded and more or less granulation extends as far down as the upper part of the last whorl. The color is chocolate black, with vermiculate or zigzag stripes of cream buff or lighter, or in one example they are washed with Hays russet.

The shells from the Butagu Valley at 2000 to 2300 m. (Pl. I, figs. 1 and 5) are broader and agree with the form I named var. *chromatica*. Some are much darker than the one figured, others having the dark markings reduced, or in three examples absent (Pl. I, fig. 5).

Another set of three shells from the Butagu Valley at about 1500 m. (Bequaert Coll.), shows a less impressed suture in two examples. The color pattern, while rather peculiar in the shell figured, having a peripheral band of blotches (Pl. I, fig. 2), intergrades through other examples into the more usual *chromatica* pattern. The specimen figured measures: length, 51.3 mm.; diameter, 21 mm.; aperture, 20 mm.

32. **Limicolaria saturata masisiensis,** new subspecies

Plate VII, Figures 6, 7, and 8

Masisi, at about 1800 m., 5 specimens (Bequaert Coll.).

The form is that of *saturata* but the last two whorls have no granulation and it is weak when present on earlier whorls. Size smaller.

Length, 51.5 mm.; diameter, 19 mm.; length of aperture, 20 mm.; 7½ whorls.

Another form is represented by a single immature shell from Masisi. It differs from *L. saturata* chiefly by the more robust figure and very slightly impressed suture.

33. **Limicolaria saturata capitellum,** new subspecies

Plate VII, Figures 9 and 10

Medje, in the Rain Forest, at about 700 m., 6 examples (Lang and Chapin Coll.).

The apex is smaller than in other described forms of the species. Granulation is wanting, or sometimes the weakest traces may be seen on the fourth and fifth whorls. As in other forms of *L. saturata*, the whorls are quite convex.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
52.5 mm.	19.4 mm.	19.0 mm.	8½	Type
46.8	18.0	17.0	8¾	

The color patterns do not differ materially from those seen in other forms of the species. There is the same pale mutation, lacking the dark pigment.

I find myself quite unable to understand Pollonera's treatment of Ruwenzori *Limicolariæ*.[1] He recognized the following forms of the *saturata* group: *L. roccatii* with var. *pallida; L. colorata* var. *fuscescens; L. saturata* with var. *brevior* v. Martens. The first, *L. roccatii*, does not appear to differ from the Butagu Valley form of *L. saturata* collected by Bequaert, unless in the sculpture, which he did not describe. This form, if it needs a subspecific name, is my var. *chromatica* (1904). Von Martens never described a var. *brevior*, the figure referred to by Pollonera representing a pathologic shell. As to *L. colorata*, it is a myth. Its basis is the type specimen of *L. saturata* Smith. Thiele's remarks on *L. saturata* and *L. smithi* should be consulted. *L. connectens* var. *elongata* Pollonera does not appear to differ much from some forms of *L. saturata*.

I have not identified *L. smithi* Preston (= *L. prestoni* C. R. Bœttger) in the material at hand. Thiele believes that *L. pura* Pollonera = *L. smithi*. See also Smith's figures, 1909, Trans. Zool. Soc. London, XIX, Pl. I.

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[1] 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 561; 1909, Il Ruwenzori, Parte Scientif., I, pp. 198-199.

Limicolaria ventricosa E. A. Smith, 1895, Proc. Malacol. Soc. London, I, p. 324, fig. 2 (on p. 323), from the region of Lake Albert Edward, 3000-4000 feet, is probably an abnormal specimen of *L. saturata*, as already suggested by von Martens (1897, Deutsch Ost Afrika, IV, Beschalte Weichth., p. 106) and by Smith himself (1909, Trans. Zool. Soc. London, XIX, p. 45).

The following forms of *L. saturata* have also been recorded from the Belgian Congo:

Limicolaria saturata var. *fuscescens* (v. Martens) PILSBRY, 1904, Man. of Conch., (2) XVI, p. 286, Pl. XXXII, figs. 22, 23 (*Limicolaria colorata* var. *fuscescens* E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 105, Pl. IV, figs. 2, 6). Migere and Iwinsa in Butumbi on the south shore of Lake Albert Edward (Stuhlmann Coll.).

Limicolaria saturata var. *chromatica* PILSBRY, 1904, Man. of Conch., (2) XVI, p. 287, Pl. XXXII, figs. 14 and 15 (*Limicolaria colorata* var. *saturata* E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 105, Pl. IV, figs. 8, 12, 14). Mt. Ruwenzori: western slope at 1200 m.; Mutambuka in Vichumbi on the south shore of Lake Albert Edward (Stuhlmann Coll.).

34. **Limicolaria festiva** (v. Martens)

Plate XV, Figures 1 to 6

Achatina (*Limicolaria*) *flammea* var. *festiva* E. v. MARTENS, 1870, Malak. Blätter, XVII, p. 33 (type locality not exactly known; from the region of the Bahr el Ghazal).

Limicolaria flammea var. *festiva* v. Martens. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 257, Pl. XVIII, fig. 95.

Moanda, 1 specimen; Niangara, 2 typical specimens; about five hours north of Faradje beyond the Aba River, in a banana plantation, over 280 specimens (Lang and Chapin Coll.).

"This large series was collected during the rainy season (August) in a small plantation close to the village of Azanga, about five hours to the north of Faradje. As many as twenty were crawling on one plantain, hidden chiefly by the dead leaves that hang in numbers around the rootstock where, during the heavy rains, decomposition offers the snails an ideal refuge, with plenty of food and protection from the sun. During the dry season these snails disappear, for they estivate under the ground; but at the rainy season they are common all around Faradje and on the way to Yakuluku.

"When food is abundant the natives pay little attention to these snails, but should famine set in they are eagerly sought and eaten.

Strings of empty shells, together with the skulls and horns of game that has fallen to their arms, are hung on poles near the entrance to Azande villages as an advertisement that good spirits helped in their success" [H. L.].

The shell is solid and strong, copiously striped with chestnut-brown to carob brown on a ground of naples yellow to deep colonial buff fading upwards, the early whorls chamois. The dark stripes are generally wider than the light ones, and are sometimes forked above. The intermediate whorls are more or less granose by the decussation of fine vertical folds; this sculpture may extend to the last whorl, but generally it is very faint there. The columella is light vinaceous drab or sometimes paler or more bluish.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
76.0 mm.	33.0 mm.	31.5 mm.	9½	Niangara
102.0	48.0	43.0	10⅓	N. of Faradje
75.0	36.5	35.0	9⅓	" "
79.5	36.5	35.5	9½	" "
74.0	32.0	33.0	9	" "
74.0	36.0	34.5	9½	" "

The individuals of 75 to 80 mm. length appear to be adult, but there are two which have added another whorl, more convex than those preceding, showing several strongly marked places of growth-arrest, and bringing the length up to about 100 mm.

This form was described as a variety of the West African *L. flammea* (Müller), a thinner shell originally from Christiansborg on the Gold Coast. The locality of *festiva* was not recorded exactly, but it was taken by Schweinfurth somewhere in the region of the Gazelle River (Bahr-el-Ghazal) or of its southern affluents, Djur and Rek.[1]

Mutation **clara**

Pl. XIV, Figures 1, and 3 to 5

In a banana plantation north of Faradje, a mutation lacking dark markings, or having them diluted, occurs with the striped typical form. The shell is naples yellow (sometimes almost chamois), fading to white on the spire, and either without markings, the apex almost white, or having stripes of ochraceous-buff (varying in different individuals from light ochraceous-buff to ochraceous-tawny), the apex pale ochraceous-salmon. Except in color these individuals agree with the typical color form of *L. festiva.*

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[1] 1870, Zeitsch. Ges. für Erdkunde in Berlin, V, 2, pp. 97-145, with map.

There are also some larger specimens (Pl. XIV, fig. 1) similar in color, having one whorl more (10), the last whorl more inflated, and often with an indistinct peripheral girdle of darker shade. They appear also to be slightly thinner. Length up to 103 mm. They are probably old shells of the same race, but there is some resemblance to *L. turris* (Pfeiffer), which seems, however, to be more distinctly granose.

In the series collected, the proportions are: typical, dark striped *festiva*, 113 examples; mut. *clara*, with ochraceous stripes, 178, and unstriped, 93.

Other Species of *Limicolaria* Recorded from the Belgian Congo

Limicolaria acuminata v. Martens

Limicolaria acuminata v. Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 183; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 113, Pl. v, fig. 4. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 294, Pl. xxxi, fig. 12.

Type locality: forest of the river Boa, in N. W. Lendu, to the west of Lake Albert (Stuhlmann Coll.); this is one of the affluents of the Ituri, at about 2° 10′ N. lat.

Limicolaria charbonnieri Bourguignat

Limicolaria charbonnieri Bourguignat, 1889, Moll. Afr. Equator., p. 102, Pl. vi, figs. 7, 8. E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth.. p. 112, Pl. v, fig. 2. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 293, Pl. xxxi, figs. 1, 3. Germain, 1905, Bull. Mus. Hist. Nat. Paris, p. 255; 1908, Rés. Scientif. Voy. Afr. Foà, p. 634. Pollonera, 1909, Il Ruwenzori, Parte Scientif., I, p. 201.

Region of Lake Tanganyika: the type locality is Kibanga south of the peninsula Ubuari. Kiruwe on the south shore of Lake Albert Edward (Stuhlmann Coll.). Pollonera records this from the eastern slope of Mt. Ruwenzori: Mobuku Valley, 2000 m.

Limicolaria congolanica Putzeys

Limicolaria congolanica Putzeys, 1898, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIII, p. 5, fig. 4; and var. *lineolata* Putzeys, *loc. cit.* Pilsbry, 1904, Man. of Conch., (2) XVI, p. 271, Pl. xvii, fig. 92.

Type locality: Wathen (Dupuis Coll.).

Limicolaria connectens v. Martens

Limicolaria connectens E. v. Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 183 (type locality: northeastern shore of Lake Victoria Nyanza); 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 112, Pl. v, figs. 5, 6. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 293, Pl. xxxi, figs. 8, 9.

Semliki Valley: Karevia at the western foot of Mt. Ruwenzori, and Bundeko in the forest (Stuhlmann Coll.).

Pollonera describes a var. *elongata*, 1909, Il Ruwenzori, Parte Scientif., I, p. 199, Pl. xx, fig. 28, from the eastern slope of Mt. Ruwenzori, in the upper valley of the Mobuku.

Limicolaria dromauxi Bourguignat

Limicolaria dromauxi BOURGUIGNAT, 1889, Moll. Afr. Equator., p. 107, Pl. VI, fig. 3. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 285, Pl. XXXIII, fig. 25.

Type locality: near Kibanga, on the western shore of Lake Tanganyika.

Limicolaria elegans Thiele

Limicolaria elegans J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 204, Pl. v, fig. 41.

Kwidjwi Island (Schubotz Coll.); and in the forest 90 km. west of the southern shore of Lake Albert Edward at 1600 m. (Grauer Coll.). The type locality was not designated.

Limicolaria joubini Rochebrune and Germain

Limicolaria joubini ROCHEBRUNE AND GERMAIN, 1904, Bull. Mus. Hist. Nat. Paris, p. 142; 1904, Mém. Soc. Zool. France, XVII, p. 14, Pl. I, fig. 8.

Type locality: between the rivers Aba and Dungu at 1100 m. (du Bourg de Bozas Coll.).

Limicolaria lamellosa Bourguignat

Limicolaria lamellosa BOURGUIGNAT, 1889, Moll. Afr. Equator., pp. 104 and 109, Pl. VI, fig. 6. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 296, Pl. XXIV, fig. 1.

Type locality: peninsula Ubuari on the western shore of Lake Tanganyika (not "Mpala am Ostufer" as given by v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 113).

In the Manual of Conch., I have suggested that this remarkable little snail may belong to the buliminoid series.

Limicolaria martensiana (Smith)

Limicolaria tenebrica Reeve. H. ADAMS, 1866, Proc. Zool. Soc. London, p. 375; locality not given (not *L. tenebrica* Reeve).

Achatina (*Limicolaria*) *martensiana* E. A. SMITH, 1880, Proc. Zool. Soc. London, p. 345, Pl. XXXI, figs. 1 and 1*a* (type locality: eastern shore of Lake Tanganyika, near Ujiji).

Limicolaria martensiana Smith. CROSSE, 1881, Journ. de Conchyl., XXIX, pp. 138 and 197. PELSENEER, 1886, Bull. Mus. Hist. Nat. Belgique, IV, p. 104. E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 108, Pl. I, fig. 10. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 289, Pl. XXXIV, figs. 33-40. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 203.

Limicolaria martensi Smith. GERMAIN, 1905, Bull. Mus. Hist. Nat. Paris, p. 255; 1908, Rés. Scient. Voy. Afr. Foà, p. 634. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afr., IV, p. 32.

Limicolaria giraudi BOURGUIGNAT, 1885, Notice Prodr. Moll. Giraud, p. 24 (type locality: Mpala on the western shore of Lake Tanganyika). A. T. DE ROCHEBRUNE AND GERMAIN, 1904, Mém. Soc. Zool. France, XVII, p. 15.

Near Lake Tanganyika: Mpala. Between the rivers Aba and Dungu at 1000 m. (du Bourg de Bozas Coll.). Between Uvira and Kabambare (Grauer Coll.). La Lowa (Bequaert Coll.).

The following varieties are also recorded from the Belgian Congo:

Var. *albina* DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 33. Type locality: La Lowa (Bequaert Coll.).

Var. *elongata* E. v. MARTENS, 1883, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 72; 1885, Conchol. Mittheil., II, p. 189, Pl. XXXIV, figs. 1, 2; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 110. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 291, Pl. XXXIV, figs. 41, 42, 47, and 48. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 33. Nyangwe (type locality; Wissmann Coll.). La Lowa (Bequaert Coll.). Kala on the southeastern shore of Lake Tanganyika (after Pilsbry).

Var. *eximia* E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 183 (type locality: Kavirondo); 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 110, Pl. v, figs. 34 and 34*a*. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 291, Pl. XXXIV, figs. 44 and 45. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 33. Bukama (Bequaert Coll.).

Var. *multifida* E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 183; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 109, Pl. I, fig. 13. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 291, Pl. XXXIV, figs. 34 and 35. Type locality not given; described from the Semliki Valley: Bundeko at 750 m., Bugundi (Orani), Andetei, and Karevia (Stuhlmann Coll.).

Var. *pallidistriga* E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 182; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 109, Pl. v, fig. 1. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 290, Pl. XXXIV, fig. 46. Type locality: Mutambuka (Vichumbi) in the grass steppe south of Lake Albert Edward (Stuhlmann Coll.).

Limicolaria paludosa Putzeys

Limicolaria paludosa PUTZEYS, 1898, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIII, p. iv, fig. 2. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 270, Pl. VII, fig. 90.

Type locality: Bena Bendi (Dupuis Coll.).

Limicolaria pura Pollonera

Limicolaria smithi PRESTON, 1906, Proc. Malacol. Soc. London, VII, No. 2, p. 89, fig. on p. 90 (type locality: Uganda district). E. A. SMITH, 1909, Trans. Zool. Soc. London, XIX, p. 45, Pl. I, figs. 5-7. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 203 (not *L. flammea smithi* Pilsbry, 1904).

Limicolaria pura POLLONERA, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 561, p. 2; and var. *diluta* Pollonera (type locality: Uganda); 1909, Il Ruwenzori, Parte Scient., I, p. 200, Pl. XX, fig. 26.

Limicolaria prestoni C. R. BŒTTGER, 1913, Proc. Malacol. Soc. London, X, No. 6, p. 359, footnote (new name for *smithi* Preston).

Usumbura (at the north end of Lake Tanganyika; Grauer Coll.); Island Kwidjwi, plain of Rutshuru, Beni, west slope of Mt. Ruwenzori in the Butagu Valley at 3000 m., Boga, and between Irumu and Mawambi (Schubotz Coll.).

E. A. Smith (1909) included the *L. pura* pattern among his figures of *L. smithi*, and Thiele also takes the view that the two are synonymous. The specific term *smithi* is untenable; Pollonera's *pura* will take precedence for this species, if the conclusions of these two authorities are well founded.

Limicolaria rectistrigata (Smith)

Achatina (*Limicolaria*) *rectistrigata* E. A. Smith, 1880, Proc. Zool. Soc. London, p. 346, Pl. xxxi, fig. 2 (type locality: eastern shore of Lake Tanganyika near Ujiji).

Limicolaria rectistrigata Smith. Grandidier, 1885, Bull. Soc. Malacol. France, II, p. 161. Bourguignat, 1889, Moll. Afr. Equator., p. 103. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 292, Pl. xxxiii, figs. 27, 28, and 31. Germain, 1908, Rés. Scient. Voy. Afr. Foà, p. 633; 1905, Bull. Mus. Hist. Nat. Paris, p. 255; 1912, *op. cit.*, p. 80.

A common species on the shores of Lake Tanganyika: Karema, Mpala, Pambete, etc. Near Lake Albert Edward: Kasindi, Vichumbi (Groumier Coll.).

Var. *bridouxi* (Grandidier) Germain, 1905, Bull. Mus. Hist. Nat. Paris, p. 255 (*Limicolaria bridouxi* Grandidier, 1885, Bull. Soc. Malacol. France, II, p. 161). Near Lake Tanganyika.

Var. *melanomphalus* Germain, 1909, Bull. Mus. Hist. Nat. Paris, p. 271; 1912, *op. cit.*, p. 80. Described from the Sesse Islands in Lake Victoria Nyanza; occurs with the type at Kasindi and Vichumbi (Groumier Coll.).

Limicolaria rohlfsi v. Martens

Limicolaria rohlfsi E. v. Martens, 1894, in Kobelt, Conch. Cab., Achatiniden, p. 72, Pl. xxiii, figs. 5 and 6 (type locality: Ngadda River, northwest of the confluence of Benue and Niger); 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 107, Pl. v, fig. 36. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 288, Pl. xxxi, figs. 5-7.

Vichumbi on the south shore of Lake Albert Edward at 900 m.; Semliki Valley: Bugundi (Orani) and Andetei (Stuhlmann Coll.).

Limicolaria wathenensis Putzeys

Limicolaria wathenensis Putzeys, 1898, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIII, p. iv, fig. 1. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 269, Pl. xvi, fig. 91.

Type locality: Wathen (Dupuis Coll.).

The following must be noted as occurring possibly or doubtfully in the Belgian Congo:

Limicolaria cavallii Pollonera, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 561, p. 3; 1909, Il Ruwenzori, Parte Scientif., I, p. 201, Pl. xx, fig. 25. Type locality: eastern slope of Mt. Ruwenzori, in the Mobuku Valley at 2000 m.

Limicolaria kempi Preston, 1913, Proc. Malacol. Soc. London, X, No. 4, p. 280, fig. 8. Type locality: extreme southwestern district of Uganda.

Limicolaria kivuensis Preston, 1913, Proc. Malacol. Soc. London, X, No. 4, p. 277, fig. on p. 278. Type locality: near Lake Kivu. This appears to stand very close to *L. saturata* of Mt. Ruwenzori, if not specifically the same.

Limicolaria megalœa BOURGUIGNAT, 1889, Moll. Afr. Equator., p. 105, Pl. VI, fig. 4. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 284, Pl. XXXIII, fig. 26. Type locality: plain of Knicomba on the southwestern coast of Lake Tanganyika.

Limicolaria numidica (Reeve) PILSBRY, 1904, Man. of Conch., (2) XVI, p. 260, Pl. XIX, figs. 1-3 (*Bulimus numidicus* Reeve, 1848, Conch. Icon., V, Pl. LIII, fig. 351). C. R. BŒTTGER, 1913, Ann. Soc. Malacol. Belgique, XLVII, (1912), p. 94. Region of the Cataracts, Belgian Congo (between Matadi and Leopoldville; Tappenbeck Coll.; after Bœttger). This species is found along the Gulf of Guinea from Sierra Leone to Gaboon. The identification of the Congo specimens is open to question.

Limicolaria roccatii POLLONERA, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 561, p. 2; 1909, Il Ruwenzori, Parte Scientif., I, p. 198, Pl. XX, fig. 24. Fort Portal and the upper valley of the Mobuku on the east slope of Mt. Ruwenzori. This is probably one of the forms of *L. saturata.*

Limicolaria tulipa JOUSSEAUME, 1897, Le Naturaliste, IX, p. 6, fig. 2. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 292, Pl. XXII, fig. 45. Type locality: Congo River (French Congo?).

Limicolaria turriformis E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 181 (Kavirondo and Usoga, in Uganda); 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 102, Pl. IV, fig. 11. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 295, Pl. XXXIII, fig. 30. The var. *elongata* Pollonèra, 1909, Il Ruwenzori, Parte Scientif., I, p. 198, was recorded from the east slope of Mt. Ruwenzori in the Mobuku Valley.

PERIDERIOPSIS Putzeys

Perideriopsis PUTZEYS, 1898, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIII, p. vi; type by original designation: *P. umbilicata* Putzeys. PILSBRY, 1904, Man. of Conch., (2) XVI, p. 241.

Shell ovate-turrite, with obtuse apex, smooth apical whorls and generally smooth surface, more or less angular periphery, and angular-ovate aperture; outer lip simple, more or less thickened within; columella vertical and nearly straight, hardly truncate at base, its edge reflexed but not closing the umbilical fissure; axis perforate. Soft anatomy unknown.

This genus is very closely related to *Pseudotrochus*, which it apparently replaces in the Upper Congo Basin; it differs by the perforate columellar axis. It needs comparison also with *Limicolaria;* the differences are scarcely definable; but in coloration it is like *Pseudotrochus.*

Four closely allied species have been described, all from the Congo Basin, where they are restricted to the Rain Forest and the neighboring forest galleries. They are beautifully colored, and their pattern shows a great variation within the limits of the same species and in the same locality.

35. **Perideriopsis fallsensis** Dupuis and Putzeys

Plate VI, Figures 1 to 11

Perideriopsis fallsensis Dupuis and Putzeys, 1900, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXV, p. xiii, figs. 19 and 20. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 244, Pl. xvii, figs. 82 and 83. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 34.

Stanley Falls[1] in the forest (type locality; Dupuis Coll.). La Lowa (Bequaert Coll.).

Stanleyville, several hundred specimens (Lang and Chapin Coll.).

The shell is narrowly perforate, conically turrite, of about eight convex whorls, the last one slightly sub-angular in front. The second whorl (when unworn) has very superficial, fine and close, somewhat oblique striæ, the rest of the shell being merely smooth, without gloss. Ground color vinaceous in the upper part, the last two or three whorls cartridge buff, below the periphery almost white and a little glossy. The markings are in the form of irregular stripes, often forked in the middle of the convexity of each whorl, with narrow stripes or spots intercalated below the suture. The stripes are more or less interrupted at the periphery, or sometimes continuous from suture to base. The aperture is ovate, somewhat oblique. The columella is spirally curved above, and curves into the basal margin below. The outer lip is sharp, not expanded, dark-edged, with a slight submarginal thickening of the bluish-white internal layer.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
47.5 mm.	19.0 mm.	17.4 mm.	8
49.0	20.0	18.5	8
42.7	16.4	15.5	8
46.8	16.8	15.5	8½
42.0	18.0	16.4	7½

I have identified this extremely abundant snail with *P. fallsensis* Dupuis and Putzeys, although the upper whorls are not in the least granular in these examples, but are so described for *P. fallsensis*. Unfortunately, authentically determined specimens of the latter are not at hand for comparison. I cannot confirm the character in question, upon which the validity of the determination depends.

The color pattern is worked out with great individual freedom as to detail, but the same patterns occur in the three mutations. It is a case where the inheritance factor for color has varied independently of that for pattern, as often occurs in mollusks. Nearly all of the specimens may be assorted into three principal mutations.

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[1] This is the locality now called Stanleyville; the specimens of the Congo Expedition come thus from the same place as the type.

a. Mutation **fallsensis.**—The markings are black on the last two or three whorls, changing to hazel on the upper ones (Pl. VI, figs. 1, 2, and 3).

b. Mutation **pronuba.**—Markings and upper whorls apricot-buff (varying to paler or to hazel); the cartridge-buff ground often much reduced (Pl. VI, figs. 7, 8, and 9).

c. Mutation **sponsa.**—Markings olive-buff (or lighter) or opaque cartridge-buff (or nearly white). Columella typically whitish but more frequently livid violet (Pl. VI, figs. 10 and 11).

These mutations co-exist in the same colonies, doubtless interbreeding, so that the greater number of individuals are no doubt hybrids. There is, however, good segregation, since blending shells are relatively scarce. Probably the presence of rose on the spire and violet on the columella in some individuals of the albinistic mutation *sponsa* are visible evidences of crossing. There is also a form of mut. *pronuba* with part or all of the base and a subsutural band marked with black (Pl. VI, fig. 8). These may be *fallsensis* + *pronuba* hybrids in which characters of both are visibly blended; yet since some other species of *Perideriopsis* have the same pattern, *P. umbilicata nsendweensis* for example, that interpretation is probably inadequate.

Pl. VI, fig. 5 represents a very unusual pattern.

"The various mutations of *Perideriopsis fallsensis* Dupuis and Putzeys have all been collected on the right bank of the Congo River, at Stanleyville. They are the most common land snails there and the numerous plantain gardens are their real haunts. A few were found crawling over more open places covered with grass, often together with *Limicolaria distincta* Putzeys. These few individuals belonged mostly to the dark and brown freckled type. The variation of color was striking among the numerous specimens living in the shady plantations. Those with bluish black, dark and light brown, yellowish and translucent white patterns were seen crawling side by side, but the extreme forms were of course rare. They never crawl about in spots exposed to bright sunlight and the most propitious time for collecting are cloudy days after heavy rains. They often climb upward on the vegetation but habitually they seek cover in the obscurity near the ground among the abundant plant detritus, so that their great number is easily overlooked" [H. L.].

Other Species of *Perideriopsis* Recorded from the Belgian Congo

Perideriopsis formosa Dupuis and Putzeys

Perideriopsis formosa Dupuis and Putzeys, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. xxxiv, figs. 1 and 2; and var. *pallida*, *op. cit.*, p. xxxv. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 243, Pl. xvii, figs. 80 and 81.

Type locality: Island of Mvula facing La Lowa (in the Congo River; Dupuis Coll.).

Perideriopsis mvulaensis Dupuis and Putzeys

Perideriopsis mvulaensis Dupuis and Putzeys, 1900, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXV, p. xiv, figs. 21 and 22. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 245, Pl. xvii, figs. 78 and 79.

Type locality: Island of Mvula facing Nsendwe, and an island below the mouth of the Lowa River (Congo River; Dupuis Coll.).

Perideriopsis umbilicata Putzeys

Perideriopsis umbilicata Putzeys, 1898, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIII, p. vi, fig. 5. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 242, Pl. xvii, fig. 85. J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 204. C. R. Bœttger, 1913, Ann. Soc. Malacol. Belgique, XLVII, (1912), p. 95.

Bena Bendi (type locality; Dupuis Coll.). Between Uvira and Kasongo (Grauer Coll.). Upper Congo (O. Baumann Coll.).

Var. *albida* Dupuis and Putzeys, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. xl. Nsendwe (Dupuis Coll.).

Var. *lowaensis* Dupuis and Putzeys, 1901, *op. cit.*, p. xl. Ravine facing the mouth of the Lowa River (Dupuis Coll.).

Var. *nsendweensis* Dupuis and Putzeys, 1901, *op. cit.*, p. xxxix. Nsendwe, on the under side of banana leaves (Dupuis Coll.).

PSEUDOTROCHUS H. and A. Adams

Pseudotrochus H. and A. Adams, 1855, Genera of Recent Molluscs, II, p. 135. Pilsbry, 1904, Man. of Conch., (2) XVI, p. 219.

Perideris Shuttleworth, 1856, Notitiæ. Malacologicæ, I, p. 76.

This is a West African genus, extending from Liberia to the Gaboon, and also found on Prince's Island. The following species has been described by Germain from the "Congo," but its occurrence in the Congo Basin is extremely doubtful; the term "Congo" often includes the Gaboon among French colonials.

Pseudotrochus belli Germain, 1908, Bull. Mus. Hist. Nat. Paris, p. 53, fig. 30 (on p. 54). Type locality: "Congo" (J. M. Bel Coll.) without any definite place. In 1909, Arch. Zool. Expér., (5) I, p. 91, Germain gives as locality: "sur les bords du Congo" and marks it on his map of the distribution of *Pseudotrochus* as occurring between Boma and the mouth of the Congo River.

Stenogyrinæ

Shell turrited or cylindric, rarely ovate, unicolored or with darker streaks. No internal lamellæ. Axis slender, solid or nearly so.

Tropics of both hemispheres.

Key to the Genera Known from the Belgian Congo

1. Shell with its apex subacute, summit of the trochoidal or conic type. Columella abruptly truncate at all stages of growth.............................2.
Apex of the shell bulbous, hemispherical, the first whorl apically depressed or involute...3.

2. Embryonic whorls smooth. Shell oblong-conic......*Bocageia*, subgenus *Liobocageia* Pilsbry.
Embryonic whorls sculptured with spiral engraved lines. Shell slender, subulate.....................................*Subuliniscus* Pilsbry.

3. Columella conspicuously and abruptly truncate below, achatinoid. Shell imperforate..4.
Columellar margin dilated, straight or concave, passing without truncation or notch into the basal margin. Shell thin, ovate or turrited, usually perforate or rimate..8.

4. Shell subulate, involute at tip, the embryonic first whorl forming an eccentric concave apex. Whorls flattened, numerous (12), the last whorl acutely carinate..................................*Ceras* Dupuis and Putzeys.
Apex obtuse and rounded, not involute. Whorls not flattened..............5.

5. Embryonic whorls vertically ribbed or reticulate. Post-embryonic whorls rib-striate, the base smoother. Shell ovate-pyramidal or turrited. *Pseudoglessula* O. Bœttger.
Apex smooth, or with short folds or grains below the suture, or distinctly granular. Post-embryonic whorls smoothish.........................6.

6. Shell broadly lanceolate, with rapidly enlarging whorls. Eggs oval. *Nothapalus* v. Martens.
Shell slender, turrited-conic.. ....7.

7. Eggs oblately spheroidal. Newly hatched young shell subglobular, with depressed summit. Shell very pale yellowish or corneous..*Subulina* Beck.
Eggs long-oval. Embryonic shell lengthened, of 2½ to 3½ whorls, with the summit more conic. Shell typically covered with a colored, brown-streaked cuticle..*Homorus* Albers.

8. Shell ovate or oblong-conic...9.
Shell quite small, turrited-conic. Outer lip of the aperture not sinuous, though usually arched forward. Columella straight or concave, not sinuous.....10.

9. Embryonic whorls vertically ribbed, the post-embryonic whorls rib-striate.
Pseudoglessula, subgenus *Kempioconcha* Preston.
First embryonic whorl smooth, the next vertically grooved, but not ribbed. Shell translucent, thin. Aperture with strongly sinuous outer lip. Columella slightly sinuous or straight............................*Curvella* Chaper.

10. Embryonic whorls smooth..................................*Opeas* Albers.
Embryonic whorls finely striate spirally...............*Pseudopeas* Putzeys.

HOMORUS Albers

Homorus ALBERS, 1850, Die Heliceen, p. 196 (monotypic: *Achatina cyanostoma* Pfeiffer). PILSBRY, 1905, Man. of Conch., (2) XVII, p. 130 (monograph).

Shell imperforate, thin or solid, turrited-conic, the spire usually a little contracted near the summit, which is obtuse and rounded; embryonic shell subcylindric. Post-embryonic whorls smoothish, typically covered with a colored, brown-streaked cuticle. Aperture achatinoid, the columella concave, truncate below.

The genus can be divided as follows:

I. Embryonic whorls smooth..............................*Homorus*, proper.
Includes *H. cyanostoma* (Pfeiffer) and other species of Abyssinia; this group does not occur in the Belgian Congo.
II. Embryonic whorls smooth, or with short folds or grains below the suture.
Subgenus *Subulona* v. Martens.
III. Embryonic whorls distinctly granular.........*Oreohomorus*, new subgenus.

Distribution (Fig. 39).—This genus is restricted to tropical Africa; though generally abundant in the equatorial belt, it does not appear to extend as far south as many of its associates. However, its range can at present be indicated in its broad lines only. Future investigation must considerably modify the limits given on our map, since some species described as *Stenogyra*, *Subulina*, and possibly other genera may prove to belong in *Homorus*. So far as known the typical forms, or *Homorus* proper, are restricted to Abyssinia, while *Subulona* and *Oreohomorus* are chiefly West African, extending from Sierra Leone to Angola along the coast of Guinea, and inland, covering the entire Rain Forest area. In the savannah country these two groups occur in the forest galleries and the isolated forest patches: near Lakes Tanganyika and Victoria Nyanza, along the affluents of the Ubangi (Krebedje), in Usagara and Usambara, etc. *Subulona* has been recorded from Fernando Po. Species of *Homorus* are often found in abundance in shady, moist places (near sources, in ravines, at the entrance of caves, etc.), underneath decaying leaves and in humus soil.

A good account of the soft anatomy is still a desideratum; imperfect data on several species indicate diversity in external characters of the foot and some difference in dentition. Unfortunately, no adult individuals of any of the large species were preserved in alcohol by the Congo Expedition. A young specimen of *H. bequaerti* and an adult *H. clarus* supply some notes.

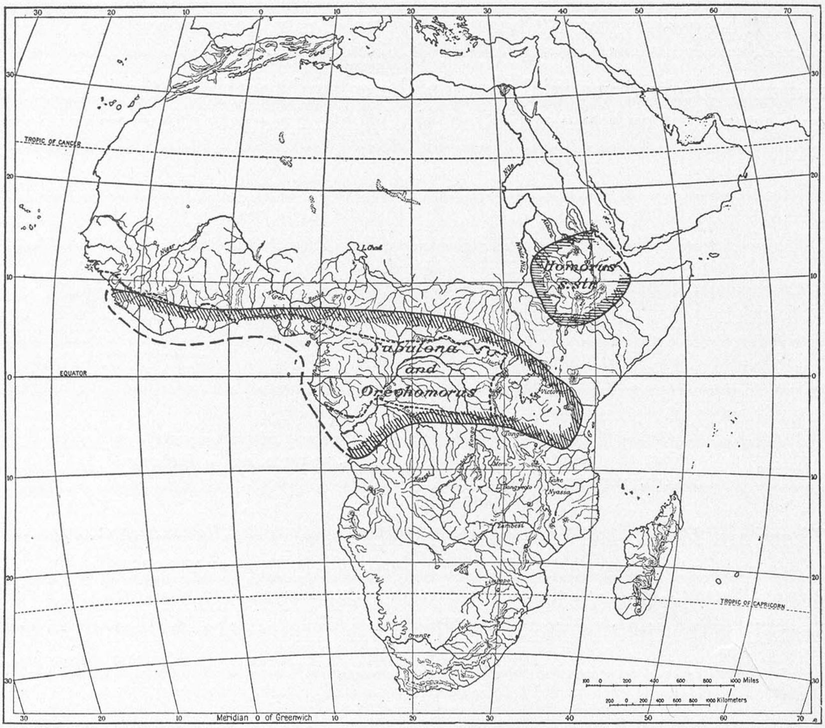
Homorus s. str.
Subulona and Oreohomorus
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
Meridian 0 of Greenwich
Miles
Kilometers
Niger
Nile
Victoria
Tanganyika
Nyassa
Zambezi
Orange

Fig. 39. Distribution of the subgenera of *Homorus*. *Homorus*, proper, in Abyssinia; *Subulona* and *Oreohomorus* in West and Central Africa.

The foot is short. In *H. bequaerti* the upper surface of the tail is flat, expanded laterally in form of a triangular area with projecting lateral angles, and strongly keeled sides; the posterior extremity is rounded; the straight anterior border formed by a ridge. The surface is coarsely granular. This tail shield is much wider than the sole in the preserved specimen.

In *H. clarus* the tail is rounded above but has small lateral tubercles.

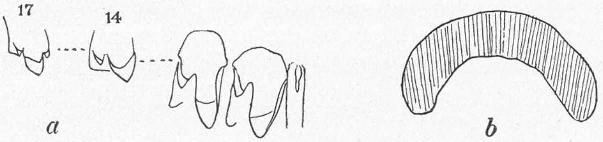

Fig. 40. Teeth (*a*) and jaw (*b*) of *Homorus bequaerti*, new species.

H. bequaerti (Fig. 40) has a rather weak jaw, densely and very finely striate vertically (not ribbed, as described for *H. cyanostoma*). The radula has only a vestigial cusp on the central tooth. Laterals have no entocones, but on some of the marginal teeth a minute entocone appears.

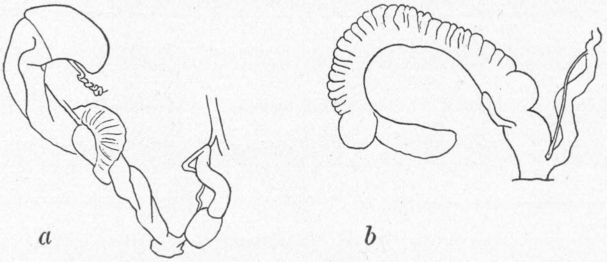

Fig. 41. Genitalia, *a* of *Homorus clarus*, new species; *b* of *Homorus bequaerti*, new species, immature.

There are 24, 12, 1, 12, 24 teeth. In *H. cyanostoma*, type of the genus, there are entocones on the lateral teeth, according to Jickeli.

In *H. bequaerti* and *H. clarus* the very short penial retractor is a branch of the right ocular band. The vas deferens is terminal (Fig. 41).

Subgenus **Subulona** v. Martens

Subulona v. Martens, 1889, Conchol. Mittheil., III, p. 9; as a subgenus of *Stenogyra*. Pilsbry, 1905, Man. of Conch., (2) XVII, p. 138; as a subgenus of *Homorus*.

Type: *Stenogyra badia* v. Martens, designated by Pilsbry, 1905.

The subgenus is here used for species having the embryonic whorls either smooth, or with short folds or grains below the suture. The embryonic whorls of *H. badius*, the type of *Subulona*, have not been definitely described; it is not known whether they are granose or smooth at the suture.

36. **Homorus (Subulona) langi,** new species

Plate XVII, Figure 4

Zambi, over 300 specimens (Lang and Chapin, and Bequaert Coll.).

"In the dry season (June 1915), this snail was found in copious quantities in several small ravines close to the bank of the Congo River, between Zambi and the place marked on our map as Samboela. The torrents during the rainy season had washed the soil from the lime stones, which we moved one by one. Empty shells were lying in the numerous crevices and a few live ones, with apertures closed by a thin, white epiphragm fixed somewhat in from the edge, were found estivating, unattached, nearly a foot down. Many other small species of land mollusks were found together with this" [H. L.].

The shell is slender, turrited, cinnamon-brown, fading to almost white on the embryonic whorls, sparsely marked with widely, unevenly spaced, oblique, carob brown lines or narrow streaks, which are not very conspicuous. The embryonic stage, of 4½ whorls and 6.5 mm. long, is cylindric with convexly conic, obtuse summit, the whorls smooth except for a close series of very short but strong folds below the suture (Fig. 42). Neanic and last whorls very slowly widening, having a series of unequal, retracted folds below the suture, elsewhere very finely, irregularly, obliquely striate, the striæ cut into long granules by very superficial spiral lines. All of the whorls are very gently convex, almost flat, the last one being slightly angular in front (distinctly angular in immature individuals). The aperture is strongly oblique, ovate. The columella is quite deeply concave above, then straightened and sloping to the right, abruptly truncate at the base. The outer lip is thin and acute.

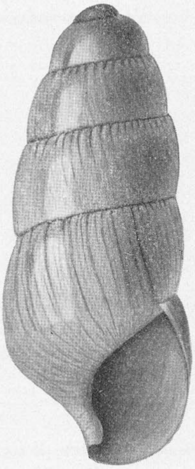

Fig. 42. *Homorus langi*, new species; embryonic whorls and one neanic whorl.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
46.0 mm.	9.3 mm.	9.5 mm.	12	Largest specimen
43.9	8.8	9.3	12⅓	
43.0	9.0	9.4	12	Type specimen
41.6	8.7	9.0	12	
34.0	8.5	7.8	10½	
39.0	8.7	8.0	11½	

This species is closely related to *H. lugubris* (Morelet),[1] from Landana, yet the constant differences in proportions in the great number examined indicate specific distinction. The chief differences are as follows:

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[1] 1883, Journ. de Conchyl., XXXI, p. 399, Pl. x, fig. 4; copied in Pilsbry, 1905, Man. of Conch., (2) XVII, p. 154, Pl. LX, figs. 76, 77.

	H. lugubris	*H. langi*
Length	61 mm.	34 to 46 mm.
Diameter	10 mm.	8.5 to 9.3 mm.
Number of whorls	14	12
Diameter contained in length	6 times	4.8 to 5 times
Aperture contained in length	5.5 times	4.5 to 4.7 times

The narrowest *H. langi* is distinctly wider than *H. lugubris*, and the largest *langi* only three-fourths the length of the Landana snail. The average length of ten fully adult specimens taken at random is 38.39 mm.

H. involutus (Gould),[1] *H. pattalus* Pilsbry,[2] and *H. sowerbyanus* (Morelet)[3] belong to the same group, but are readily distinguishable specifically from *H. langi.*

37. **Homorus (Subulona) silvicola** (v. Martens)

Subulina (*Subulona*) *silvicola* E. v. Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 184 (type locality: forest between the Lakes Albert and Albert Edward); 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 119, Pl. v, fig. 20. Pollonera, 1909, Il Ruwenzori, Parte Scientif., I, p. 203.

Homorus silvicola v. Martens. Pilsbry, 1905, Man. of Conch., (2) XVII, p. 141, Pl. lx, fig. 87. J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 205.

Semliki Forest between the Lakes Albert and Albert Edward: at the ferry of the Semliki River, Bundeko, Bukende; a smaller form from Migere in Butumbi (Stuhlmann Coll.). Upper Ituri (Schubotz Coll.). Pollonera records it from the eastern slope of Mt. Ruwenzori, in the valley of the Mobuku at 2000 m. (forma *minor*).

Medje, 7 specimens (Lang and Chapin Coll.). Avabuki, 8 specimens, and Lesse, 1 specimen, under decaying leaves in the forest (Bequaert Coll.).

The shell is rather solid. The spire is a little attenuated in the upper part, which is rather large, at the end of the third whorl measuring about 3.8 mm. in diameter. The color in the single shell from Lesse is between chamois and olive-ochre, with a few brownish streaks and growth-arrest lines. Those from Avakubi are nearly chestnut brown, showing very little of the chamois ground except in the upper half, or in the half-grown shells only in the first three or four whorls. The surface is *very glossy*, smooth except for slight growth-wrinkles, and an irregular, fine, but rather strong retracted puckering below the suture, which is slightly crenulated thereby in some places. The embryonic shell is subcylindric with rounded conic summit, smooth whorls, and very minutely, unevenly *crenulated suture*. The whorls are slightly convex in the upper part, becoming nearly flat in the lower; the last whorl being obscurely subangular at the periphery. The aperture is oblique, bluish or fleshy within, ovate. The columella is strongly concave, abruptly truncate at base.

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[1] *Achatina involuta* Gould, 1843, Proc. Boston Soc. Nat. Hist., I, p. 158. *Homorus involutus* Pilsbry, 1905, Man. of Conch., (2) XVII, p. 150, Pl. lix, figs. 70 and 71. Sierra Leone, Liberia, Togo, Kamerun.

[2] 1905, Man. of Conch., (2) XVII, p. 147, Pl. lix, figs. 65-68. Liberia.

[3] *Stenogyra sowerbyana* Morelet, 1890, Journ. de Conchyl., XXXVIII, p. 67, Pl. i, fig. 3. *Homorus sowerbyanus* Pilsbry, 1905, Man. of Conch., (2) XVII, p. 145, Pl. lix, figs. 72-74. Near Lake Tanganyika, probably from its eastern side.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
49.3 mm.	10.7 mm.	10.7 mm.	12	Medje
51.8	11.8	11.5	12	Medje
49.5	10.0	9.8	10½	Medje
67.0	13.0	13.5	13	Avakubi
59.0	12.3		12	Avakubi
54.5	12.0	12.3	11½	Lesse

The range westward is considerably extended by these localities. The variation in color and size is noteworthy.

Homorus (Subulona) kwidschwiensis Thiele

Homorus kwidschwiensis J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 205, Pl. v, fig. 44.
Type locality: Island Kwidjwi (Schubotz Coll.).

38. **Homorus kwidschwiensis nigricans,** new subspecies

Plate XVII, Figure 1

Masisi, in the lower mountain forest, at about 1800 m. (Bequaert Coll.).

The shell is rather slender, the diameter contained about four times in the length; outlines of spire slightly concave in the upper fourth. The upper part is isabella color with chestnut streaks on the earlier neanic whorls, but it becomes darker downwards, the last two whorls being blackish brown. The surface has a varnish-like gloss, with sculpture of weak wrinkles of growth, the lower border of the suture being irregularly, minutely puckered. The summit is rounded. Embryonic shell of 4½ whorls, cylindric, 3 mm. in diameter at the third whorl; these whorls smooth except for a minute, close crenulation below the suture. The whorls are very slightly convex, almost flat, the last one obtusely angular at the periphery. The aperture is blue within. Columella deeply concave, a rather broad, thin, white lamina emerging and forming its edge in the lower half; the basal truncation abrupt. The outer lip is broken at the edge in the single specimen taken.

Length, 45.3 mm.; diameter, 11.5 mm.; length of aperture, 11.8 mm.; 11½ whorls.

This form stands near *H. silvicola* (v. Martens), resembling that in the sculpture and the shape of the last whorl. It differs by the conspicuously smaller diameter of the whorls forming the embryonic shell. The columellar lamina is broader. *H. kwidschwiensis* Thiele is a somewhat narrower shell with the early whorls somewhat less slender, but until a direct comparison of specimens can be made I am inclined to think the differences not of specific importance. The single example of *nigricans* has been marred and scratched by fragments of glass, the container having broken in transit.

39. **Homorus (Subulona) alberti,** new species

Plate XVII, Figure 3

Medje, 2 specimens (Lang and Chapin Coll.).

"These shells were found empty at the foot of a hill, lying singly among the stones which, although moved, failed to disclose any live specimens" [H. L.].

The shell is slender, the diameter contained about five times in the length; solid, nearly straight-sided, but perceptibly contracted near the summit; white under an ochraceous cuticle, streaked obliquely with chestnut and on the last whorl having several nearly black streaks. The surface is glossy, marked with low, strongly oblique growth-wrinkles, which are a little retracted and puckered just below the suture. The summit is rounded; the embryonic whorls are worn, but they appear to be smooth, with a minutely, rather weakly crenulated suture. The following whorls are very weakly convex, almost flat, the last one not angular at the periphery. The aperture is strongly oblique, ovate, bluish within. The columella is deeply concave above, straightened and oblique below, abruptly truncate.

Length, 65.2 mm.; diameter, 12.5 mm.; length of aperture, 13 mm.; 13½ whorls.

This shell of royal stature is similar to *H. silvicola* in sculpture and color, but differs in the shape of the last whorl, which is narrower and not in the least angular. The diameter, at the third whorl, is 3.6 mm.

40. **Homorus (Subulona) amputatus,** new species

Plate XVII, Figures 8 to 10*a*, 13, and 14

Medje, type locality, 60 specimens (Lang and Chapin Coll.). Beni, in the forest gallery of the Semliki River, beneath decaying grass (Bequaert Coll.).

"These snails were common at the base of the hill where the station of Medje is built. They occurred in numbers under and between moist laterite covered with moss, ferns, and decayed leaves, at the bottom of a deep ravine filled with dense vegetation, close to the edge of a source. They apparently moved about only in the dark, raising then the tip of the shell considerably" [H. L.].

The adult shell is thin, subcylindric, slightly tapering, composed of about 5 convex whorls, the earlier ones having been lost; summit squarely truncate, the breach closed by a semicircularly curved, tongue-like, convex septum. The thin cuticle is dark olive-buff to citrine-drab, inconspicuously marked with one or two oblique chestnut lines on each whorl. Embryonic shell cylindric, of 3½ smooth whorls, with rounded summit, the suture well impressed, very minutely crenulated by a series of tiny tubercles (Pl. XVII, fig. 10). Subsequent whorls are minutely marked with growth-wrinkles, slightly stronger just below the suture, which is rather deeply impressed and not crenulated. The aperture is oblique, ovate, subvertical, curving into the parietal wall above, obliquely truncate at the base. The outer lip is thin.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*[1]	
26.5 mm.	7.3 mm.	7.6 mm.	5⅔	Type
24.4	6.4	6.8	6⅓	
20.0	6.2	6.4	4¾	

This species resembles *H. decollatus* (Morelet), *H. courteti* Germain,[2] and *H. lentus* (Smith) by having the spire mutilated in the adult stage. Only one of the specimens over 12 mm. long has the spire entire. This one (Pl. XVII, fig. 10*a*) is 23 mm. long, 5.2 mm. in diameter, of 9½ whorls. Comparison with adult shells shows that it is one or two whorls short of full growth, so that the total number of whorls formed is about 11 or 12, perhaps 13 in specimens of the largest diameter.

The diameter at the second whorl is 1.7 mm. An egg is oblong, 2 × 3.9 mm., ivory-yellow, with minutely roughened shell.

The largest specimen from Beni is 30 mm. long, with 6⅓ whorls. Others from that locality closely resemble the type lot in form and size.

H. courteti Germain tapers more rapidly than any stage of this species. *H. decollatus* (Morelet), from Gaboon, has the whorls less convex. *H. lentus* (Smith), from Tanganyika, is a larger shell with "very slightly convex" whorls and a relatively smaller aperture. These three species, together with *amputatus*, form a little group in *Homorus*, characterized by autotomy and light olivaceous coloring.

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[1] The partial volution of the apical septum is included, the upper whorl counted being incomplete.

[2] 1907, Bull. Mus. Hist. Nat. Paris, p. 349. Krebedje (French Congo).

There are two specimens also from Medje (Plate XVII, figs. 13 and 14), which differ from the remainder by being in every way larger, the whorls being noticeably more convex:

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
33 mm.	7.6 mm.	7.7 mm.	6½
31.8	7.7	7.8	6

An embryonic shell with these specimens differs from that stage in typical *amputatus* by being decidedly larger. It measures 2.5 mm. at the end of the third whorl, where *H. amputatus* measures 1.7 mm., other characters being alike. If this embryo belongs to the associated large shells, it probably indicates a species distinct from *H. amputatus;* but a series of the neanic stage to demonstrate the connection is not at hand, and the embryo may possibly belong to some other species of *Homorus.*

41. **Homorus (Subulona?) clarus,** new species

Plate XVII, Figures 11, 11*a* and 12

Rutshuru, in a forest gallery along the Rutshuru River at 1200 m.; 7 specimens (Bequaert Coll.).

The shell is slender, subulate, a little attenuated in the upper part, thin, deep olive-buff or a little more inclined to yellow, fading in the upper part of the spire. Surface glossy, with weak, irregular growth-wrinkles only. The apex is obtuse and rounded. The embryonic whorls (Pl. XVII, fig. 11*a*) are smooth, probably nearly three in number, but the termination of the stage is not distinctly marked; the first one is convex, the next nearly flat, the suture even and very little impressed. These whorls form a subcylindric portion, after which there is a regular, slow increase in diameter, with more impressed suture, the whorls being slightly convex. The suture has a narrow transparent border throughout, upon which the growth-wrinkles are a shade stronger and slightly retracted. The last whorl (Fig. 43) is not angular. The aperture is somewhat oblique, ovate. Columella moderately concave and obliquely truncated at the base.

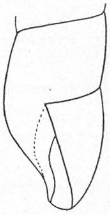

Fig. 43. *Homorus clarus,* new species; last whorl.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
28.8 mm.	6.4 mm.	7.2 mm.	10½	Type
29.0	7.0		10½	

There is also a stouter form, one specimen, in another lot from the same place (Pl. XVII, fig. 12). It probably falls within the range of variation of this species, but is not connected in the series at hand. Length, 28.3 mm.; diameter, 7.3 mm.; aperture, 8.3 mm.; 9 whorls.

By its color and texture this species resembles *Nothapalus*, but the cylindric early whorls are exactly as in *Homorus*. Several Abyssinian species have similar pale color.

The inner lateral teeth of the radula are bicuspid; on the outer ones there is a blunt inner cutting point, but no distinct cusp.

42. **Homorus (Subulona?) lionepion,** new species

Mt. Ruwenzori: western slope in the Butagu Valley, lower mountain forest, at about 2200 m.; 1 specimen (Bequaert Coll.).

The shell (Fig. 44) is subulate, a little attenuate in the upper part of the spire, marguerite yellow with numerous clear subtransparent streaks; thin; glossy, with only faint traces of growth-wrinkles. The suture is even at first, but throughout post-nepionic stages a very minute crenulation appears, weaker in places. The summit is convexly conic, as usual. The first whorl is not depressed, the embryonic whorls smooth. Whorls moderately convex, the last rounded. The aperture is oblique. Columella deeply concave, abruptly truncate anteriorly. Outer lip thin.

Length, 10.6 mm.; diameter, 2.8 mm.; length of aperture, 3 mm.; 8 whorls.

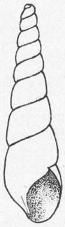

Fig. 44. *Homorus lionepion*, new species.

This *Subulina*-like species is notable for its smooth embryonic whorls, without subsutural crenulation or folds, and for the pale color. The summit and early whorls have the shape characteristic of *Homorus*.

43. **Homorus (Subulona) ischnus,** new species

Plate XVII, Figure 5

Ituri Forest: Avakubi, type locality, 50 specimens; and Penge, 40 specimens (Bequaert Coll.). Medje, 5 specimens (Lang and Chapin Coll.). Lesse in the Semliki Forest, 12 specimens and Moho near Lesse, 1 specimen (Bequaert Coll.).

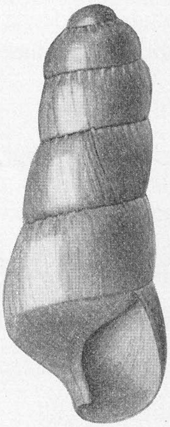

Fig. 45. *Homorus ischnus*, new species; embryonic and two neanic whorls.

The shell is subulate, lightly attenuate in the upper part; dresden brown, with indistinct cinnamon-brown or almost chestnut-brown streaks; glossy under a lens, showing very slight growth-wrinkles. The whorls are moderately convex. A little more than the initial half whorl is smooth; following 2½ whorls of the embryonic shell cylindric, having short but well-developed narrow folds below the suture (Fig. 45). The subsequent whorls increase regularly but slowly in width and amplitude, and show uneven sutural crenulation, less sharp than in the embryonic stage. The last whorl is subangular peripherally. The aperture is oblique, ovate. Columella strongly and regularly concave, and abruptly truncate at the base. Outer lip thin.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
20.7 mm.	3.9 mm.	3.6 mm.	11½	Avakubi; type
18.9	3.8	3.4	11½	Avakubi
16.0	3.7	3.3	10½	Avakubi
18.4	3.6	3.4	11½	Penge
15.0	3.3	3.0	10⅓	Lesse

Homorus nigellus (Morelet)[1] of Angola is very closely related to this snail but in examples of the same length it has more whorls, which are therefore shorter. In the single specimen from the Morelet collection which I have seen there are 2½ embryonic whorls, while *H. ischnus* of the same length has 3½.

The embryonic shell has a diameter of 1.5 mm. Fig. 45 shows a young individual having two neanic whorls in addition to the embryonic.

This species also resembles *H. foveolatus* Preston[2] closely in form, size, and color. It differs by the larger aperture, if Preston's account is trustworthy. With a length of 16.25 mm., his shell is said to have an aperture of 2 mm. altitude, while in the present species shells of that length have the aperture over 3 mm. long. Moreover, he says nothing of sutural folds, which are a prominent character of *H. ischnus*. Yet, as the descriptions given by this author are often inadequate, and the photographic figures are bad, one works under a handicap when dealing with them. The remoteness of the locality of *H. foveolatus*, Akok, thirty to thirty-five miles inland from Kribi, Kamerun, lends probability to the belief that *H. ischnus* is distinct, since the Ituri and Semliki Forests have few species identical with those of Kamerun.

Homorus manueli Preston,[3] from Angola, has a wider shell, with only very weak traces of subsutural crenation on the embryonic whorls. *Subulina megaspira* Mabille is probably a *Homorus* of the *nigellus* group, having more whorls and a larger aperture than *H. ischnus*. *H. jouberti* (Bourguignat) has about the size of *H. ischnus*, but the figure shows it less attenuate above and it is described as "*translucida, pallide lutescente*."

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[1] *Achatina nigella* Morelet, 1868, Voy. Welwitsch, Moll. terr. et fluv., p. 80, Pl. v, fig. 3. *Homorus nigellus* Pilsbry, 1905, Man. of Conch., (2) XVII, Pl. LVII, fig. 34.

[2] 1909, Ann. Mag. Nat. Hist., (8) III, p. 186, Pl. VII, fig. 15. This is not *Homorus foveolatus* Preston, 1912, Rev. Zool. Afric., I, 3, p. 324, Pl. XVII, fig. 17, from Mt. Kenangop, British East Africa, which may be called **Homorus robinkempi**, new name.

[3] 1910, Proc. Malacol. Soc. London, IX, p. 54, fig.

OREOHOMORUS, new subgenus

The surface of the embryonic whorls is distinctly granular by the intersection of vertical wrinkles and deeply engraved spiral lines. Type: *H. bequaerti*, new species.

44. **Homorus (Oreohomorus) osborni,** new species

Plate XVII, Figure 2

Zambi, 4 specimens (Lang and Chapin Coll.).

The shell is club-shaped, the greatest diameter about one-third of the length; the outlines of the spire are slightly concave; solid. The ground-color is between ecru-olive and isabella color, lightly streaked with a darker shade in the upper third, the last three whorls profusely streaked with blackish chestnut. There is a primrose yellow (or paler) denuded patch in front of the aperture.

The surface is slightly glossy, and shows weak, fine lines of growth; under the microscope, one sees an elegant and minute sculpture of very close, fine axial striæ and equally close impressed spirals, which cut the striæ into oblong granules. This sculpture appears on the third whorl, the first two having no spirals. The summit is very blunt, rounded. First two whorls somewhat convex, the next two flat, the rest weakly convex. The spire is thick above, measuring 4 mm. in diameter at the middle of the fourth whorl. The suture is superficial, linear, a shallow spiral impression defining a narrow margin below it. The last whorl is bluntly angular at the periphery, the base sloping, only slightly convex. The aperture is slightly oblique, trapezoidal, pale blue within. The columella is evenly concave, abruptly truncate at the base. Outer and basal margins are thin and sharp.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
41.5 mm.	13.5 mm.	12.5 mm.	9½	Type
38.0	13.0	12.0	8¾	

This fine species, named for Prof. H. F. Osborn, the President of The American Museum of Natural History, differs from other West African forms of *Homorus* by its broad club-like shape and the beautiful microscopic sculpture. *H. martensi* (Dupuis and Putzeys) of the Upper Congo is somewhat similar, but relatively narrower, with more whorls.

45. **Homorus (Oreohomorus) castaneus** (v. Martens)

Plate IV, Figures 7 and 8

Subulina (*Subulona*) *castanea* E. v. MARTENS, 1895, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 129; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 118, Pl. v, figs. 7 and 8.

Homorus castaneus v. Martens. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 139, Pl. LX, figs. 85 and 86. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 205.

Mt. Ruwenzori: western slope, in the Butagu Valley (type locality); at 2500-3800 m., in the moss of the *Erica* forest and in the bamboo forest at 2600 m. (Stuhlmann Coll.); in the *Erica* region at 3300 m. (Schubotz Coll.). Von Martens records this species also from the Wembere steppe in German East Africa, southeast of Lake Victoria Nyanza; this record might be based on a confusion of labels.

Mt. Ruwenzori: western slope in the Butagu Valley, very common between 2000 and 3800 m. in the bamboo and *Erica* region; over 100 specimens (Bequaert Coll.).

This is a highly variable species. An average specimen (Pl. IV, fig. 7) measures: length, 44 mm.; diameter, 13.5 mm.; 8½ whorls.

Two representing nearly or quite the extremes in shape, are figured. These extremes are fully connected by specimens of intermediate contours, in the long series at hand.

Length	*Diameter*	*Number of Whorls*	
39.8 mm.	15.4 mm.	8¼	Fig. 46*a*
38.7	12.0	8½	Fig. 46*b*

The ordinary coloring in this lot is of chestnut-brown streaks on a chamois (or in places sometimes mustard yellow) ground; the base, when the cuticle is worn off, being barium yellow. There are, however, about seven specimens in which the last four whorls are black, or black with indistinct lighter streaks (Pl. IV, fig. 8). Some of these exceed the shells of normal color, the largest measuring: length, 60 mm.; diameter, 16.5 mm.; 10½ whorls (Pl. IV, fig. 8).

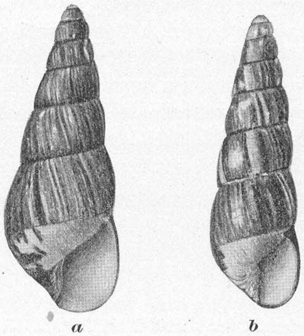

Fig. 46. *a* and *b*, *Homorus castaneus* (v. Martens); extremes of contour variation among specimens from the Butagu Valley, Mt. Ruwenzori. Natural size.

Von Martens gave the dimensions of the typical form as:

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
47 mm.	13.5 mm.	12 mm.	9
54	15.0	14	10

The var. *clavata* v. Martens,[1] 37×13 mm., 8 whorls, falls within the range of continuous variation of the Butagu Valley series, and is evidently not of racial value. Fig. 46*a* is a somewhat broader specimen than the type of *clavata*.

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[1] 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 119, Pl. v, fig. 9.

46. **Homorus (Oreohomorus) fuscostrigatus** E. A. Smith

Homorus fuscostrigatus E. A. Smith, 1909, Trans. Zool. Soc. London, XIX, p. 46, Pl. i, fig. 14(type locality: Mobuku Valley, eastern slope of Mt. Ruwenzori, 7000 feet).

Mt. Ruwenzori: western slope in the Butagu Valley, at about 1800 and 2200 m. (Bequaert Coll.).

Found with *H. castaneus*, but very distinct by the slender shape and beautiful granulation of the whorls. The specimens are larger than Smith's type, one measuring 40 mm. long, 9.9 mm. wide, with 11½ whorls, and the upper part of the spire is noticeably more slender than his figure shows it; but possibly the drawing is faulty.

H. mamboiensis circumstriatus (v. Martens) is a decidedly broader shell.

47. **Homorus (Oreohomorus) olivaceus** Pollonera

Plate XVII, Figures 7 and 7*a*

Homorus olivaceus Pollonera, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 568, p. 1; 1909, Il Ruwenzori, Parte Scientif., I, p. 202, Pl. xx, fig. 23.

Type locality: Mt. Ruwenzori, in the valley between Mt. Baker and Mt. Stanley at 4000 to 4500 m. (Duca degli Abruzzi Coll.); this locality is on the western slope at the upper part of the Butagu Valley.

Mt. Ruwenzori: western slope in the upper Butagu Valley at 3800 m., 2 specimens and at 4000 m., 1 specimen (Bequaert Coll.).

The shell is imperforate, chestnut-brown, fading to yellowish in the upper whorls, very glossy, as though varnished. The whorls are strongly convex. The lateral outlines are very slightly contracted near the summit. The apex is rounded, the tip not depressed. The first half whorl is smooth; the following two whorls, composing the embryonic shell, are finely striate, the striæ coarser and recurved in the upper half, and decussated by weakly impressed spiral lines, chiefly in the middle and lower part of each whorl. The next three whorls have extremely delicate, close striæ cut by shallow spiral lines. Some trace of this sculpture continues on the penult whorl as spiral bands of microscopic vertical wrinkles; but these are scarcely apparent on the last whorl, which has slight growth-wrinkles only. The suture is unevenly crenulate on the middle part of the spire. The columella has a whitish edge near the base, and is rather strongly concave, abruptly truncate below. The thin, sharp outer lip is black-edged.

Length, 28 mm.; diameter, 10 mm.; length of aperture, 9.6 mm.; 8 to 8½ whorls (the tip imperfect).

This form agrees with *Homorus olivaceus* Pollonera and *H. bicolor* Smith by the strongly convex whorls. It is larger than either. The spire is much longer than in *H. bicolor;* in that species Smith mentions "the thickening of the labrum on the outside with a rounded rib." Something of the same kind is visible in the form here described, as one of the low folds of the surface is placed immediately behind the lip and in slightly more prominent than those preceding it; this is so little pronounced, however, that it would not have been noticed except for Smith's remark.

H. olivaceus, as described and figured by Pollonera, is similar in contour, but differs in being smaller, 17 × 6 mm., with about 8 whorls, the apex wanting, and also in color; these discrepancies are presumed to be due to difference in age.

The description and figure of the embryonic whorls are from a young shell, 13 mm. long, lighter colored, of 5¾ whorls; the apical whorl of the adult shell is worn, and the extreme tip broken.

48. **Homorus (Oreohomorus) bequaerti,** new species

Plate XVII, Figures 6 and 6*a*

Mt. Ruwenzori: western slope, in the Butagu Valley at about 2200 m., in the lower mountain forest, 5 specimens, one of which is the type; also in the Lanuri Valley at about 2000 m., 2 specimens (Bequaert Coll.).

The shell is sinistral, club-shaped, chamois, somewhat suffused and streaked with brownish black (when dead, cinnamon brown), and having a few narrow, irregularly spaced, more intense blackish brown streaks. The whorls are but weakly convex. The summit is conic, worn at the tip; the first two whorls elsewhere have deeply engraved spirals and close vertical wrinkles, producing a very distinctly expressed granulation, which is weaker near the basal limit of each whorl (Pl. XVII, Fig. 6*a*). The next whorl has very fine, close, oblique striæ decussated by weakly impressed spiral lines. On the following whorl the decussation weakens, the last three whorls being very closely striate, the striæ extremely fine, chiefly cuticular, giving a somewhat silky sheen. The suture is even. The aperture is distinctly oblique, and bluish within. Columella somewhat curved, obliquely truncate at the base. The outer lip is thin.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
34.5 mm.	10.5 mm.	10.0 mm.	9⅓	Butagu Valley; type
37.0	11.0	10.3	9½	Lanuri Valley

The early whorls have stronger sculpture than those of *H. castaneus* and *H. fuscostrigatus*, but similar in type. The enlarged detail of the summit, Pl. XVII, fig. 6*a*, is from one of the Lanuri shells.

One specimen from the Butagu Valley is slightly more conic: length, 34.4 mm.; diameter, 12 mm.; 9½ whorls.

So far as I know, this is the only sinistral *Homorus* known.

Other Species of *Homorus* Recorded from the Belgian Congo

Homorus badius (v. Martens)

Stenogyra badia E. v. MARTENS, 1889, Conchol. Mittheil., III, p. 8, Pl. XXXVIII, figs. 13-14.

Homorus (*Subulona*) *badius* v. Martens. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 149, Pl. LX, fig. 75.

Type locality: Congo River.

Homorus cylindraceus (Bourguignat)

Subulina cylindracea BOURGUIGNAT, 1889, Moll. Afr. Equator., p. 115, Pl. V, figs. 2-3.

Homorus (*Subulona*) *cylindraceus* Bourguignat. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 144, Pl. LVII, figs. 29-30.

Type locality: wooded places of the peninsula Ubuari (western shore of Lake Tanganyika).

Homorus jouberti (Bourguignat)

Subulina jouberti BOURGUIGNAT, 1889, Moll. Afr. Equator., p. 115, Pl. V, fig. 4.

Homorus (*Subulona*) *jouberti* Bourguignat. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 144, Pl. LVII, fig. 31.

Type locality: wooded parts of Ubembe, on the western coast of Lake Tanganyika.

Homorus lentus (Smith)

Subulina lenta E. A. SMITH, 1880, Ann. Mag. Nat. Hist., (5) VI, p. 428 (type locality: northeastern regions of Lake Tanganyika); 1881, Proc. Zool. Soc. London, p. 284, Pl. XXXIII, fig. 15. BOURGUIGNAT, 1889, Moll. Afr. Equator., p. 114.

Homorus (*Subulona*) *lentus* Smith. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 143, Pl. LX, fig. 79.

Peninsula Ubuari, on the west coast of Lake Tanganyika.

Homorus mamboiensis (Smith)

Stenogyra (*Subulina*) *mamboiensis* E. A. SMITH, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 158, Pl. V, fig. 16 (type locality: on the plains within 50 miles of Mamboya, German East Africa.)

Homorus (*Subulona*) *mamboiensis* Smith. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 140, Pl. LX, fig. 83. POLLONERA, 1909, Il Ruwenzori, Parte Scientif., I, p. 202.

The typical form was not found in the Belgian Congo. Pollonera records it from the eastern slope of Mt. Ruwenzori, in the valley of the Mobuku River, at 2000 m.

Homorus mamboiensis var. *circumstriatus* (E. v. Martens)

Subulina mamboiensis var. *circumstriata* E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 119.

Homorus (*Subulona*) *mamboiensis* var. *circumstriatus* v. Martens. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 140.

Type locality: western slope of Mt. Ruwenzori, in the bamboo forest at 2600 m. (Stuhlmann Coll.).

Homorus mamboiensis var. *nitidus* (E. v. Martens)

Subulina mamboiensis var. *nitida* E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 119.

Homorus (*Subulona*) *mamboiensis* var. *nitidus* v. Martens. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 140.

Type locality: Migere in Butumbi (Stuhlmann Coll.).

Homorus martensi (Dupuis and Putzeys)

Subulina (*Subulona*) *martensi* DUPUIS AND PUTZEYS, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. xxxvii, fig. 9.

Homorus (*Subulona*) *martensi* Dupuis and Putzeys. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 148, Pl. LX, fig. 78.

Type locality: Nsendwe (Dupuis Coll.).

Homorus opeas Pilsbry

Homorus (*Subulona*) *opeas* PILSBRY, 1905, Man. of Conch., (2) XVII, p. 151, Pl. LIX, figs. 60-62 (type locality: Cape Palmas). C. R. BŒTTGER, 1913, Ann. Soc. Malacol. Belgique, XLVII (1912), p. 96.

Banza Manteka, in the Lower Congo (Tappenbeck Coll.).

The following species occur probably in the Belgian Congo.

Homorus bicolor E. A. SMITH, 1909, Trans. Zool. Soc. London, XIX, 1, p. 46, Pl. I, fig. 15. Eastern slope of Mt. Ruwenzori, in the Mobuku Valley, at 7000 feet.

Homorus courteti GERMAIN, 1907, Bull. Mus. Hist. Nat. Paris, p. 349, fig. 25. Krebedje (Fort Sibut), in the Upper Ubangi region (French Congo).

Homorus iredalei PRESTON, 1912, Proc. Zool. Soc. London, p. 189, Pl. XXXI, fig. 10. Between Mbarara and Kigezi, extreme S. W. Uganda.

Homorus (*Subulona*) *lugubris* (Morelet) PILSBRY, 1905, Man. of Conch., (2) XVII, p. 154, Pl. LX, fig. 76. =*Stenogyra lugubris* MORELET, 1883, Journ. de Conchyl., XXXI, p. 399, Pl. X, fig. 4. Landana.

Homorus megaspira (Mabille) =*Subulina megaspira* MABILLE, 1884, Bull. Soc. Philomath. Paris, (7) VIII, p. 40. Congo (probably the French Congo).

Homorus nebulosus (Morelet) PILSBRY, 1905, Man. of Conch., (2) XVII, p. 148, Pl. LVII, fig. 37. =*Stenogyra nebulosa* MORELET, 1883, Journ. de Conchyl., XXXI, p. 400, Pl. X, fig. 5. Landana.

CERAS Dupuis and Putzeys

Ceras DUPUIS AND PUTZEYS, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. xxxviii. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 155.

Type: *Ceras dautzenbergi* Dupuis and Putzeys.

The following are the characters given in the original diagnosis: "Shell thin, covered with a very thin cuticle. Embryonic first whorl at fir ; slightly ascending, then horizontally involuted over the left part of the spire, forming an eccentric concave apex. Following whorls numerous, slowly increasing, flattened, forming a long, subulate spire. Last whorl truncate-carinate, the keel projecting, bimarginate. Columella regularly very concave, abruptly truncate in front. Aperture subquadrate, the lip simple." Viviparous snails.

This genus includes only the following two species from the Belgian Congo, neither of which is represented in this collection.

Ceras dautzenbergi Dupuis and Putzeys

Ceras dautzenbergi DUPUIS AND PUTZEYS, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. xxxviii, fig. 10. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 155, Pl. XLIV, fig. 3. DAUTZENBERG AND GERMAIN, 1914, Rev. Zoolog. Afric., IV, p. 34.

Nsendwe (type locality; Dupuis Coll.). Vieux Kassongo (Bequaert Coll.).

Ceras manyemaense Dupuis and Putzeys

Ceras manyemaense DUPUIS AND PUTZEYS, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. xxxviii, figs. 11-13. PILSBRY, 1905, Man. of Conch., (2) XVII, p. 155, Pl. XLIV, figs. 4-5; and var. *cingulatum* Dupuis and Putzeys, *op. cit.*, p. xxxix.

Type locality, for the typical form and the variety: Nsendwe (Dupuis Coll.).

NOTHAPALUS v. Martens

Nothapalus E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 124; as a subgenus of *Subulina;* monotypic for *Subulina paucispira* v. Martens.

Kenia PRESTON, 1911, Ann. Mag. Nat. Hist., (8) VII, p. 473; type by original designation: *K. suturalis* Preston.

The shell is imperforate, broadly lanceolate, thin, somewhat translucent, pale colored, and very glossy; the summit is obtuse, rounded; the embryonic whorls smooth; aperture acutely ovate, the columella concave, truncate below.

The eggs are oval. The penis contains a large papilla and is continued in a long epiphallus; its retractor is a branch of the right ocular muscle.

The pericardium is about half as long as the kidney.

The tail is simply convex above, pointed posteriorly.

This genus is only found in tropical Africa, but its range there cannot be defined at present.

Kenia Preston, proposed as a subgenus (of what genus not stated), appears to be equivalent to *Nothapalus* so far as one can gather from the published account. The following species have been described.

Kenia suturalis Preston, 1911, Ann. Mag. Nat. Hist., (8) VII, p. 473, Pl. XII, fig. 28. Mt. Kenia 9-10,000 ft.

Kenia iredalei Preston, 1911, *op. cit.*, p. 473, Pl. XII, fig. 29. Mt. Kenia, 6-8000 feet.

Kenia obesa Preston, 1912, Rev. Zool. Afric., I, p. 326, Pl. XVII, fig. 18. S. W. Uganda.

Nothapalus was originally proposed as a subgenus of *Subulina*. It differs from that genus by the relatively shorter kidney, the oval eggs, different structure of the penis, and by the broader shell, of more rapidly enlarging whorls. By the form of the eggs and embryonic shell it resembles *Homorus*.

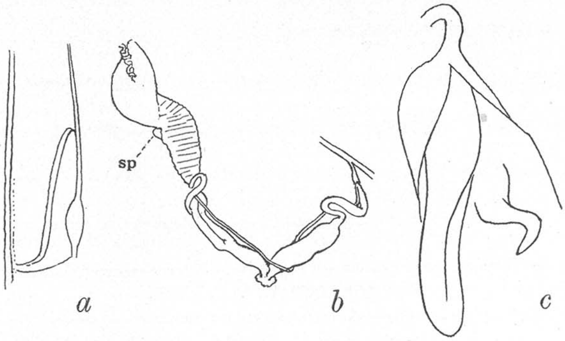

Fig. 47. *Nothapalus paucispira xanthophaes*, new subspecies: *a*, diagram of kidney and pericardium; *b*, genitalia: sp, spermatheca; *c*, penis opened to show the papilla and lateral process.

The West African species of the group of *Achatina lævigata* Pfeiffer[1] may prove to belong to *Nothapalus*. They have been placed in the Indian genus *Glessula*.

In *Nothapalus paucispira xanthophaes* the pericardium is nearly half as long as the kidney. The secondary ureter is open throughout (Fig. 47*a*).

Length of lung, 15 mm.; kidney, 6 mm.; pericardium, 2.5 mm.

The penial retractor is very short and inserted distally on the right ocular muscle. The vas deferens is apical, and at first bound to the epiphallus. The penis contains a very long papilla, and a small, sickle-shaped fleshy process (Fig. 47*c*).

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[1] Pilsbry, 1909, Man. of Conch., (2) XX, p. 106.

Length of penis, 3.5 mm.; epiphallus, 5.5 mm.; papilla of the penis, 3 mm.; vagina, 3.3 mm.; spermatheca and duct, 5.5 mm.

Nothapalus paucispira (v. Martens)

Subulina paucispira E. v. Martens, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 177; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 124, Pl. i, fig. 14; Pl. v, fig. 23. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 95, Pl. xiv, fig. 51. Pollonera, 1909, Il Ruwenzori, Parte Scientif., I, p. 203.

Semliki Forest: Karevia, 1175 and 1200 m. at the western foot of Mt. Ruwenzori, Bundeko, Bukende, Bugundi; and at the ferry of the Ituri River (region of Kilo) (Stuhlmann Coll.). Pollonera records it from the eastern slope of Mt. Ruwenzori in the Mobuku Valley at 2000 m. Smith (1894, Proc. Malacol. Soc. London, I, p. 165) gives it from the Eldoma Ravine, south of Lake Baringo.

This species was originally described from Karevia and the ferry of the Ituri River, but the type locality was not designated.

49. **Nothapalus paucispira xanthophaes,** new subspecies

Plate XIX, Figures 1 and 2

Ituri Forest: Avabuki, 10 specimens (type locality) and Penge, 110 specimens; under decayed leaves (Bequaert Coll.).

The shell is lanceolate, the outlines a little contracted near the apex; thin, imperforate, chamois colored, fading toward the apex; sufficiently transparent to show the axis faintly through; brilliantly glossy, under the lens showing faint wrinkles of growth. The summit is rounded, the first whorl depressed but not involute at the tip, next whorl increasing the diameter but little; the subsequent whorls regularly increasing and slightly convex. The suture is even, not much impressed, and is bordered by a very narrow grayish band. The aperture is ovate, rather oblique. The columella is moderately concave, white, and abruptly truncate at the base. Outer lip thin and sharp.

Length	*Diameter*	*Length of Aperture*	*Number oj Whorls*	
22.3 mm.	6.6 mm.	7.6 mm.	7¾	Avakubi
21.0	6.0	7.2	7½	Avakubi
19.8	6.5	7.2	7⅓	Avakubi; type
19.8	5.8	7.0	7½	Penge
20.6	6.0	7.1	7½	Penge
16.7	5.4	6.0	7	Penge

This race or subspecies, which appears to be rather abundant, agrees in most respects with *Subulina* (*Nothapalus*) *paucispira* v. Martens; but that is described as "fein gestreift, die Anwachsstreifen unmittelbar unter der Naht etwas stärker und etwas zurückgebogen." In my specimens, the very slight growth-wrinkles are hardly retracted enough at the suture to be noticed. In *N. paucispira* the aperture falls a little short of being one-third the length, but in *N. p. xanthophaes* it is constantly if slightly more than one-third.

The epiphragm is white, parchment-like but brittle, shaped like the aperture. In the middle, inside, there is an irregularly V-shaped, sharp ridge, one branch of which passes into a ridge running to the apex (Pl. XIX, fig. 2).

"The specimens closed by an epiphragm were found estivating under dead leaves and in the superficial layer of loose earth, in the forest at Penge, in the first part of February 1914. Penge is in the typical Rain Forest, where there is no distinction of wet and dry season; it rains throughout the year. Occasionally, however, there are irregular periods of several weeks without any rain, and the forest may then, in its higher portions, become very dry. Such a dry period was experienced from January 24 to February 12, during my stay at Penge" [J. B.].

The eggs are oval, white, very slightly roughened, and measure 1.75 × 2.5 mm. (Pl. XIX, fig. 2).

A form of this species in which the last two whorls are slightly longer was taken by Lang and Chapin at Medje. It may be a distinct race; yet as only one of the four specimens is mature, and the difference may prove individual rather than racial, it may be left with this notice. Length, 25.4 mm.; diameter, 7 mm.; length of aperture, 8.8 mm.; 8 whorls.

50. **Nothapalus ptychoraphe**, new species

Plate XIX, Figure 4

Semliki Valley: Kisuki at the western foot of Mt. Ruwenzori, 1400 m.; 3 specimens (Bequaert Coll.).

The shell is oblong-lanceolate, thin, chamois colored, imperfectly transparent, brilliantly glossy. Sculpture of fine, very light wrinkles of growth, and a subsutural series of short, low folds, retracted toward the suture but scarcely at all crenulating it. The first two and a half whorls are smooth, the summit conic with rounded apex. The whorls are gently convex. Suture but weakly impressed, nearly even, indistinctly margined with gray. The aperture is ovate, slightly oblique. The columella, deeply concave above, is somewhat straightened and white below, in a front view, and at the base it is abruptly but not very deeply truncate. The outer lip is thin, the cuticle slightly projecting at the edge.

Length, 16 mm.; diameter, 6 mm.; length of aperture, 6.4 mm.; 6 ⅓whorls.

The species is distinguished by the regular and distinct, if weak, plication below the suture, on all post-embryonic whorls. There is no contraction of the sides near the apex.

51. **Nothapalus sororcula,** new species

Plate XIX, Figure 3

Mt. Ruwenzori: western slope, in the Butagu Valley, at about 2200 m., 1 specimen (type locality); Mukule, at 1800-2000 m., 1 immature specimen (Bequaert Coll.).

The shell resembles *N. ptychoraphe* in sculpture, summit, and aperture, but differs in being much more slender. The last whorl is cream-buff, the spire paler.

Length, 13 mm.; diameter, 4.5 mm.; length of aperture, 5.2 m..; 6⅓ whorls.

It is quite unlike immature *N. ptychoraphe* of the same length.

52. **Nothapalus cælatus,** new species

Plate XIX, Figure 6

Mt. Ruwenzori: western slope, in the Lamia Valley, at about 2500 m., 1 specimen (Bequaert Coll.).

The shell is imperforate, rather broadly lanceolate, thin, olive-buff, slightly transparent, brilliantly glossy. First 2½ whorls smooth, the rest sculptured with rather deeply engraved grooves in the direction of growth-lines, somewhat unevenly spaced, rather crowded on the spire, slightly less so on the last whorl. These grooves retract slightly at the suture but the sculpture is not stronger there, and on the last whorl they weaken gradually at the periphery, leaving only low growth-wrinkles on the basal half. The summit is rounded. The outlines of the spire contract very slightly near the apex. The suture is even, margined with a gray border. The aperture is long-ovate, oblique. The columella is nearly straight in a front view, sigmoid as viewed obliquely from the right, white, curving into the parietal wall above, rather abruptly truncate at the base. The outer lip is very thin, in the largest example having a smoothly finished edge.

Length, 19.4 mm.; diameter, 7.5 mm.; length of aperture, 8.7 mm.; 6⅔ whorls.

There are fewer whorls than in *N. paucispira xanthophaes*, and they increase more rapidly in both length and diameter, so that the aperture and the diameter are greater. Also, it differs conspicuously in sculpture.

53. **Nothapalus cælatus debilis,** new subspecies

Plate XIX, Figure 5

Mt. Ruwenzori: western slope in the Lanuri Valley, at about 2000 m. (Bequaert Coll.).

The shell is smaller and a trifle more slender than *cælatus*, of paler tint; otherwise similar.

Length, 13.2 mm.; diameter, 4.8 mm.; length of aperture, 5.8 mm.; 6½ whorls.

The two following species, described from Mt. Ruwenzori by Pollonera seem to differ from the preceding forms:

Nothapalus de-albertisi (Pollonera) = *Glessula de-albertisi* Pollonera, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 538, p. 2; 1909, Il Ruwenzori, Parte Scientif., I, p. 201, Pl. xx, fig. 11. Pilsbry, 1909, Man. of Conch., (2) XX, p. 106. Type locality: eastern slope of Mt. Ruwenzori, Bihunga in the Mobuku Valley at 2500 m.

Nothapalus ferussacioides (Pollonera) = *Glessula ferussacioides* Pollonera, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 561, p. 3; 1909, Il Ruwenzori, Parte Scientif., I, p. 202, Pl. XX, fig. 10. Pilsbry, 1909, Man. of Conch., (2) XX, p. 105. Type locality: eastern slope of Mt. Ruwenzori in the Mobuku Valley, at about 2000 m.

BOCAGEIA Girard

Bocageia Girard, 1893, Jorn. Sc. Math. Phys. Nat. Ac. Sc. Lisboa, (2) III, p. 100 (genus monotypic for *Bulimus lotophagus* Morelet). Pilsbry, 1905, Man. of Conch., (2) XVII, pp. 191 and 216.

Trichodina Ancey. Pilsbry, 1906, Man. of Conch., (2) XVII, p. 182.

Shell imperforate, solid, turrited-conic, the summit conic, not in the least mamillate; the apex minute; whorls rapidly enlarging, flattened, often ribbed. Adult sculpture various. Aperture small, achatinoid, the columella truncate at all stages, or obliquely truncate in the young and continuous with the basal margin in the adult stage.

I. Columella obliquely truncate in the young, continuous with the basal margin in the adult. Whorls covered with regular longitudinal striæ. *Bocageia*, proper.

II. Columella abruptly truncate at all stages of growth.
  IIa. Surface irregularly rib-striate, covered with a hairy or fibrous cuticle. *Petriola* Dall.
  IIb. Surface relatively smooth, the cuticle not hairy. *Liobocageia*, new subgenus.

The type of this genus, *Bocageia lotophaga* (Morelet), is a solid *Euglandina*-shaped species of Prince's Island, having a regularly striate spire of flat whorls, and a columella which is not truncate in the adult stage, though obliquely so in the young. *Petriola* Dall (new name for *Trichodina* Ancey, preoccupied) has for type *Bocageia marmorea* (Reeve), a roughly, irregularly sculptured shell of similar form, in which the columella is distinctly truncate at base. It is from the Island San Thomé. In working over these forms some years ago, the writer ranked *Petriola* as a subgenus of *Bocageia;* an arrangement which still appears to be natural.

LIOBOCAGEIA, new subgenus

The subgenus *Liobocageia* is here proposed for the smooth *Bocageiæ* having the columella abruptly truncate at all stages of growth, the type being *B. runssorina* (v. Martens).

The discontinuity of distribution of this genus has been referred to in my monograph.[1]

Bocageia, proper, contains only one species from Prince's Island; *Petriola* is found on the West African islands of the Gulf of Guinea and on the Comoro Islands; so that it is exceptionally interesting to find a group of species midway between the previously known areas of the genus.

Homorus robinkempi Pilsbry (see p. 122, footnote) and *H. kenangopensis* Preston,[2] from the Aberdare Range, appear to be related to the following species.

54. **Bocageia (Liobocageia) interioris,** new species

Plate IV, Figure 5; Plate XIX, Figure 13

Mt. Ruwenzori: on the west slope in the Lanuri and Lamia Valleys, at about 2500 m.; 6 specimens (Bequaert Coll.); one of the specimens from the Lanuri Valley is the type.

The shell is rather thin but strong, oblong-conic, covered with an opaque cuticle. The spire is light yellowish olive, becoming brown on the last whorl, finally auburn with yellowish streaks. The surface is glossy, very weakly marked with slight growth-wrinkles only, except that some of the earlier whorls show faintly traced spiral lines. The lateral outlines of the spire are convex, the summit conic; the whorls are slightly convex and increase rapidly. The aperture is oblique, ovate, white within. The columella is slightly concave above, straight below, and abruptly truncate at the base. The outer lip is thin and acute.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
33.0 mm.	12.0 mm.	12.8 mm.	7	Type; Pl. IV, fig. 5
35.3	12.2		7⅓	Lanuri Valley

Pl. XIX, fig. 13 is from a Lamia Valley specimen.

This graceful snail has the general appearance of *B. monacha olivacea* (Pilsbry)[3] and other species of the Comoro Islands. Also of *B. clavus* (Pfeiffer) of San Thomé.

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[1] 1905, Man. of Conch., (2) XVII, p. 182.

[2] 1912, Rev. Zool. Afric., I, p. 324, Pl. XVII, figs. 16 and 17.

[3] *Trichodina monacha olivacea* Pilsbry, 1905, Man. of Conch., (2) XVII, p. 189, Pl. LVII, figs. 25 and 26.

55. **Bocageia (Liobocageia) runssorina** (v. Martens)

Glessula runssorina E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 184; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 114, Pl. v, figs. 11 and 12. PILSBRY, 1909, Man. of Conch., (2) XX, p. 104, Pl. XIV, figs. 6 and 10.

Homorus runssorinus v. Martens. E. A. SMITH, 1909, Trans. Zool. Soc. London, XIX, p. 47.

Mt. Ruwenzori: western slope at 3100 m. in the Butagu Valley (type locality; Stuhlmann Coll.). Smith records it from the eastern slope, in the Mobuku Valley at 10,000 feet.

Mt. Ruwenzori: western slope in the Lanuri Valley at about 3500 m.; 7 specimens (Bequaert Coll.).

The first half whorl is smooth, vertical striæ and spiral impressed lines then beginning weakly. The second whorl is distinctly striate, the striæ cut by fine spirals. Suture even. Slightly over two whorls form the embryonic shell. The next whorl is finely, rather sharply striate, the later whorls only faintly striate, with little gloss. The third and fourth whorls have distinct and conspicuous though low folds below the suture, but on the last whorl there are none. The cuticle projects at the lip and curves in upon drying, giving it a smooth finish. The specimens are of nearly uniform size, somewhat larger than the smaller one measured by von Martens. The color varies from ochraceous-tawny to hazel with the spire ochraceous-tawny.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
16.0 mm.	7.3 mm.	7.5 mm.	5½
15.8	7.0	7.3	5½

The central teeth of the radula (Fig. 48) have the mesocone well developed. There are about 15 laterals, all tricuspid. The inner marginal teeth are tricuspid, outer ones losing the entocone.

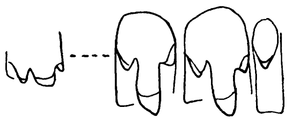

Fig. 48. Teeth of *Bocageia runssorina* (v. Martens).

The lung has no macroscopically noticeable venation aside from the pulmonary vein. Kidney and ureter as in *Nothapalus paucispira xanthophaes*.

The penis (Fig. 49) is swollen and contains a short papilla at the apex, elsewhere slender. The walls of the cavity are densely papillose, without ridges. There is a long epiphallus with a short connection with the right ocular retractor, which therefore functions as a penial retractor. The spermatheca is scarcely wider than its duct.

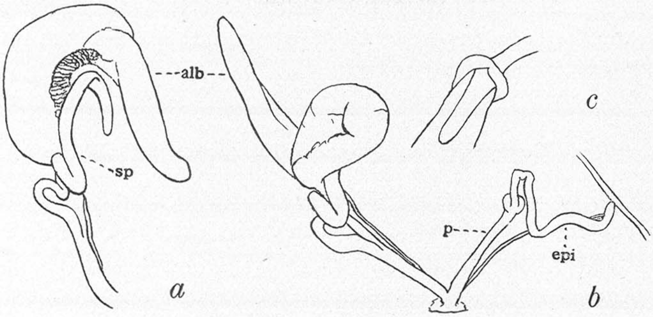

Fig. 49. *a*, *b*, and *c*, Genitalia of *Bocageia runssorina* (v. Martens): alb, albumen gland; *c*, penis-papilla; epi, epiphallus; p, penis; sp, spermatheca.

Length of the penis, 4.5 mm.; epiphallus, 8 mm.; penis papilla, 1.3 mm.; vagina, 3.7 mm.; spermatheca and duct, 12 mm.

The tail is simply convex above, pointed posteriorly.

56. **Bocageia (Liobocageia) germaini,** new species

Plate XXIII, Figure 9

Mt. Ruwenzori: western slope in the Butagu Valley, at about 3000 m.; 8 specimens (Bequaert Coll.).

The shell is imperforate, oblong, chestnut-brown, very indistinctly streaked with darker and paler, the spire chamois.[1] The surface is glossy after the embryonic stage, having slight growth-lines, which are a little stronger and retracted below the suture. The first whorl is somewhat convex, moderately exerted, the tip only being depressed. The following 1½ whorls of the embryonic stage have very fine, weak striæ decussated by a few weakly impressed spiral lines, and weakly, irregularly plicate below the suture. The whorls are weakly convex, the suture progressively becoming a little deeper and more rapidly descending. The aperture is oblique, ovate, somewhat vinaceous within. The columella is whitish, very deeply concave above, straightened and running to the right below, terminating in a little depending point at the abrupt truncation.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
25.0 mm.	9.0 mm.	9.5 mm.	6½	
23.3	8.7	8.9	6⅓	Type
23.0	8.8	9.7		
16.9	8.0	8.3	5½	Immature

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[1] The yellow color of the spire is perhaps due, at least in part, to the action of the preservative.

This species differs from *Bocageia runssorina* (v. Martens), which came from about the same elevation, by its darker color and much more deeply concave columellar margin.

57. **Bocageia (Liobocageia) liocephala,** new species

Mt. Ruwenzori: western slope, in the Butagu Valley, at about 3000 m., 2 specimens (Bequaert Coll.).

The shell (Fig. 50) resembles *B. runssorina*, but differs in having the first two whorls smooth, fine striæ and subsutural plication beginning with the third; the last two whorls have the striation very faintly expressed and, under a strong hand-lens or the microscope, an extremely fine, shallow, spiral striation is clearly visible. The last turn of the suture descends more rapidly near the aperture, as in *runssorina.* The surface is glossy, sudan brown, becoming buff near the summit, and with an indistinct buff line below the suture. The columella is formed as in *runssorina;* it is white, with a little blunt point at the truncation.

Length, 13.8 mm.; diameter, 6.1 mm.; length of aperture, 6.5 mm.; 5½ whorls.

The shell is similar also to *B. germaini* in color and shape. It differs by being smaller; the first two whorls are smooth and glossy (in *B. germaini* legibly decussate); the following whorls, up to the beginning of the last, have distinct, short, curved folds below the suture. Finally, the columellar margin is much less concave than in *B. germaini.*

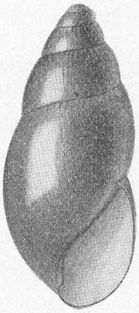

Fig. 50. *Bocageia liocephala,* new species. Type.

Subulina Beck

Subulina Beck, 1837, Index Molluscorum, p. 76. Pilsbry, 1906, Man. of Conch., (2) XVIII, pp. 71 and 220 (monograph).

Various species of *Homorus* have been described as *Subulina,* but the distinction, while not prominent, is real. Among other differences, *Subulina* has an oblately spheroidal egg-capsule, and the newly hatched young shell is subglobular with depressed summit. In *Homorus* the egg-capsule is long-oval, and the embryonic shell is lengthened, of 2½ to 3½ whorls, with the summit more conic. All of the *Subulinæ* are very pale yellowish or "corneous."

Subulina virgo Preston and *S. tribulationis* Preston,[1] from Naivasha, British East Africa, appear to be species of *Cœcilioides.*

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[1] 1911, Rev. Zool. Afric., I, p. 220, Pl. xi, figs. 2 and 7.

Subulina in a state of nature appears to be restricted to Africa and tropical America; one species, *S. octona,* has spread by commerce to the East Indies and as far as the New Hebrides.

58. **Subulina glyptocephala,** new species

Plate XVIII, Figure 10

Thysville, in a cave, 4 specimens (Bequaert, Lang and Chapin Coll.).

The shell is imperforate, turrited, thin, a little paler than tea-green, glossy. Sculpture of fine, oblique, incised lines, parting wider, smooth, somewhat flattened striæ, of which there are 4 or 5 in the space of one mm. on the face of the last whorl. At the suture, these striæ are fasciculate by twos or threes. The summit is rounded. Embryonic shell composed of two whorls having noticeably coarser sculpture than those following. The first half whorl is smooth, the next half with curved, oblique riblets; the next whorl has vertical riblets, becoming closer towards its end. The whorls are moderately convex. The last whorl has a delicate thread, continuing the suture as one may say, to the lip-edge; it interrupts the striæ, which retract a trifle there. On the base, the striation is weaker. The aperture is oblique, long-ovate, the narrowly white-edged columella is slightly concave and has a long, vertical truncation, not abrupt. The outer lip is thin and fragile.

Length, 28.8 mm.; diameter, 8 mm.; length of aperture, 8 mm.; 9½ whorls; type.
Length, 33 mm.; diameter, 8.6 mm.; 10⅓ whorls.

Subulina perstriata v. Martens, of the region south of Lake Albert Edward, resembles this species, but nothing is said of a peripheral thread on the last whorl, such as is characteristic of *S. glyptocephala.* Both forms have the embryonic shell sculptured, unlike the typical forms of the genus. *S. totistriata* Pilsbry has the same peculiarity. The aperture is entirely like that of *Subulina.*

I suspected that this species was a slender *Pseudoglessula,* but the teeth do not agree. The laterals are all tricuspid, the marginals having short cusps. The tail has a median impressed line and blunt lateral ridges, defining a rather broad, roof-shaped area and recalling the condition in *Homorus.*

59. **Subulina gratacapi,** new species

Plate XIX, Figures 7 and 7*a*

Thysville, in a cave, 12 specimens, type locality (Lang and Chapin, and Bequaert Coll.). Leopoldville, 4 immature specimens (Bequaert Coll.).

The shell is slender, turrited, deep olive-buff, thin, rather glossy. Sculpture on the later whorls of fine, somewhat irregular striæ, which become stronger and recurve above, and gather in groups to form little prominences or crenulations at the suture. On the upper third or half, the striæ are stronger, regular, somewhat flattened and wider than the impressed linear intervals. The summit is rounded; initial half whorl smooth, the following whorl having vertical striæ slightly more spaced than on the succeeding whorls. The suture is impressed; a thread revolves immediately above it. The whorls are rather strongly convex; last whorl having a delicate, scarcely noticeable encircling thread or faintly indicated angle traced below the middle. In half-grown shells this is far more distinct. The aperture is oblique, ovate The columella is nearly straight, vertical, with a thin fold forming a prominence below, the basal truncation being very oblique. The outer lip is thin, rather fragile.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
27.6 mm.	6.5 mm.	6.2 mm.	11	Type
26.4	6.0	5.5	11	
23.2	5.6	5.4	10½	

This species is much more slender than the related *S. glyptocephala* and the sculpture becomes weaker on the later whorls, where the flattened striæ are more or less split.

Named for the late Dr. L. P. Gratacap, for many years in charge of the mollusk collection of the American Museum.

60. **Subulina thysvillensis**, new species

Plate XVIII, Figures 12 and 12*a*

Thysville, in a cave, 15 specimens (Lang and Chapin, and Bequaert Coll.).

The shell is very slender, olive-buff, suffused and speckled with buff. Surface glossy, finely, quite irregularly marked with growth-wrinkles, having distinct, very short folds below the suture. The summit is rounded, the first whorl smooth, the second having very minute subsutural crenulation. The whorls are moderately convex above, the later ones rather feebly so. There is the barely visible trace of an angle below the middle of the last. The aperture is ovate, oblique. Columella slightly concave, obliquely truncate at the base.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
11.9 mm.	3.0 mm.	2.7 mm.	8	Pl. XVIII, fig. 12
17.2	3.5	3.2	10⅓	Type

The striatulate surface and strongly crenulated suture are the chief differential features of this species. The largest specimens are somewhat worn.

61. **Subulina angustior** (Dohrn)

Stenogyra (*Subulina*) *angustior* Dohrn, 1866, Malak. Blätter, XIII, p. 127 (type locality: Prince's Island).

Subulina angustior Dohrn. Girard, 1893, Jorn. Sc. Math. Phys. Nat. Ac. Sc. Lisboa, (2) III, p. 103. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 78, Pl. xi, figs. 98, 99, and 100.

Known from Prince's Island, and the coast of the Gulf of Guinea (Senegal, Liberia, Kamerun).

Stanleyville, very abundant, over 300 specimens (Lang and Chapin Coll.).

See the field notes for *Pseudopeas saxatile* (Morelet).

62. **Subulina pengensis**, new species

Plate XIX, Figure 12

Ituri Forest: Penge, 33 specimens (Bequaert Coll.).

A species of the *striatella* group. The imperforate shell is slender and turrited, dark olive-buff, rather glossy. Sculpture of straight, oblique, regular striæ, which terminate below a little distance above the suture, and above distinctly crenulate the suture, projecting there usually by pairs. On the face of the last whorl I count 14 to 15, and on the penult whorl 8 to 10 striæ in one millimeter. The summit is rounded. The embryonic shell, of two whorls, is smooth, except for very faint striation visible near the suture. The whorls are moderately convex, the suture impressed, crenulate, a very narrow smooth band above it on the later whorls. The last whorl is subangular, having a fine line below the middle in immature shells, but in the adult stage it is rounded, the line scarcely visible. The striation is just perceptibly weaker on the base. The aperture is oblique, ovate. Columella a little concave, terminating in a bluish-white, rather prominent fold, obliquely truncate below.

Length, 18.8 mm.; diameter, 4.6 mm.; length of aperture, 4.9 mm.; diameter at second whorl, 1.6 mm.; 8½ whorls.

S. glyptocephala and *S. gratacapi* are larger species with sculptured embryonic whorls. *S. striatella* (Rang) is smaller in every way with shorter whorls. *S. pengensis* is more slender than *S. lowei*, the whorls more oblique. The striæ are flattened and wider than their intervals except on the last whorl, where they are much finer, narrower, and more numerous.

63. **Subulina lowei**, new species

Plate XIX, Figure 11

Ituri Forest: Medje, type locality, over 100 specimens (Lang and Chapin Coll.). Avabuki, young specimens (Bequaert Coll.).

The shell is turrited, ecru-olive (or between that and cream-buff), but slightly glossy. The summit is obtuse; first 1¾ whorls are smooth and glossy, with an extremely minute crenulation below the suture. Subsequent whorls are very evenly and closely, obliquely striate, the striæ gathered and joined by pairs or groups at the suture, forming an irregular crenulation. Immediately above the suture a delicate spiral thread may usually be seen; and at the periphery of the last whorl this is continued as a change in sculpture rather than a thread, the base being far less sharply striate and nearly smooth in front of the aperture. On the face of the penult whorl there are 10 to 12 striæ in one millimeter. The spire tapers regularly to the summit. The whorls are rather strongly convex. The aperture is ovate. Columella concave, obliquely truncate basally.

Length, 28.3 mm.; diameter, 7 mm.; length of aperture, 6.8 mm.; 10⅓ whorls.

One of the largest species of true *Subulina.* It differs from *S. perstriata* v. Martens, *S. glyptocephala,* and *S. gratacapi* by characters of the early whorls.

The egg capsules are white, oblately spheroidal, measuring 2.3 × 2 mm. They are very similar to those of *S. octona,* which I have figured elsewhere,[1] and are small for so large a snail. As the apical whorls are somewhat worn in fully adult shells, the description of the embryonic shell is from a young one.

The species in named for Mr. H. N. Lowe.

64. **Subulina avakubiensis,** new species

Plate XVIII, Figures 11 and 11*a*

Avakubi, type locality, 5 specimens; and Lesse, 1 specimen (Bequaert Coll.).

The shell is narrow, club-shaped, thin, buff with olive-buff streaks and spots,[2] somewhat shining. Sculpture of fine, close, straight, and oblique striæ which stop a little short of the suture below, and at their upper ends part of them unite by pairs to form uneven crenulations of the suture. The apex is very blunt and rounded, rather large (the diameter at the second whorl being about 1½ mm.). Embryonic shell of two whorls, the first whorl smooth, the next having coarse riblets which do not reach to the suture below, being strong only at their upper ends. The suture is rather deeply impressed, strongly but unevenly crenulate, and a very narrow smooth band revolves above it. The last whorl shows a very weak line below the middle where the striation becomes weaker. The aperture is oblique, ovate. The columella is somewhat concave above, prominent below, obliquely truncate.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
12.8 mm.	3.2 mm.	2.8 mm.	8⅓	Type
11.4	3.2	2.9	7½	

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[1] 1906, Man. of Conch., (2) XVIII, p. 74, Pl. XII, figs. 11 and 12.

[2] The color is more or less altered, probably, by preservation in alcohol. The fresh shell may be unicolored or nearly so.

This species is more slender throughout than *S. leia* Putzeys, according to specimens from Bukama (Katanga), collected by Bequaert and received from Dautzenberg. In *S. leia* the striæ do not unite by pairs at the suture.

S. totistriata Pilsbry,[1] of Senegambia, differs in the details of sculpture of the embryonic whorls; the whorls are more convex, and the shell reaches a larger size. Compared with specimens of *S. striatella* (Rang), the present species differs by the greater diameter at the summit and the narrower last whorl; the striation is not quite so strong and close.

65. **Subulina bequaerti,** new species

Plate XIX, Figures 14 and 15

Mt. Ruwenzori: western slope, in the Butagu Valley, at about 2200 m.; 7 specimens (Bequaert Coll.).

The shell is subulate, between colonial buff and olive-buff, glossy, lightly marked with growth-lines. The apex is somewhat raised, the first whorl smooth; second and third whorls are about equal in diameter. From the second whorl on, the suture is delicately crenulated. The whorls are not strongly convex, the last one rounded, not angular below the middle. The aperture is oblique and acutely ovate. The columella is rather deeply concave, and is abruptly truncate at the base. The outer lip is thin, evenly arched, the basal margin more deeply curved.

Length, 11.8 mm.; diameter, 3 mm.; length of aperture, 2.8 mm.; 8½ whorls.

The prominent features of this species are: the general smoothness except at the finely crenulated suture; the raised apex, not depressed, as usual in *Subulina;* the quite abruptly truncate columella, not obliquely, as in typical *Subulinæ.* In the last character it differs from *S. leia* Putzeys and *S. conradti* v. Martens—species which otherwise have some resemblance to *S. bequaerti.*

Other Species of *Subulina* Recorded from the Belgian Congo

Subulina bicolumellaris v. Martens

Subulina bicolumellaris E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 186; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 122, Pl. v, fig. 25. PILSBRY, 1906, Man. of Conch., (2) XVIII, p. 90, Pl. XIV, fig. 40.

Type locality: Karevia, at the western foot of Mt. Ruwenzori, 1175 m. (Stuhlmann Coll.).

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[1] 1906, Man. of Conch., (2) XVIII, p. 81, Pl. XIII, figs. 17-19.

Subulina elegans v. Martens

Subulina elegans E. v. Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 185; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 121, Pl. i, fig. 16; Pl. v, fig. 17. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 87, Pl. xiv, fig. 35.

In the region between Lake Albert and Lake Albert Edward: Ongenya, Bundeko, Bukende, Bugundi; Migere in Butumbi, Monyonyo in Uganda (Stuhlmann Coll.). No type locality was designated.

Subulina kassaiana Rochebrune and Germain

Subulina kassaiana Rochebrune and Germain, 1904, Bull. Mus. Hist. Nat. Paris, p. 143; 1904, Mém. Soc. Zoolog. France, XVII, p. 16, Pl. i, fig. 9. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 83, Pl. xii, fig. 13.

Type locality: confluence of the Kasai and Congo Rivers, 300 m. (du Bourg de Bozas Coll.).

Subulina lasti (Smith)

Stenogyra (*Subulina*) *lasti* E. A. Smith, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 158, Pl. v, fig. 18 (type locality: Mamboya, at 4000-5000 feet, German East Africa).

Subulina lasti Smith. E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 121. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 87, Pl. xiv, fig. 36.

At the crossing of the Ituri River (region of Kilo; Stuhlmann Coll.).

Subulina leia Putzeys

Subulina leia Putzeys, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lvii, fig. 8. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 84, Pl. xiii, fig. 24. C. R. Bœttger, 1913, Ann. Soc. Malacol. Belgique, XLVII, (1912), p. 96. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 36.

Nsendwe in the Manyema (type locality; Dupuis Coll.). Banza Manteka (Tappenbeck Coll.). Kisantu; Lisala; Moi Pungoi (between Ankoro and Kikondja); Kikondja; Bukama; Niemba kunda (near Kiambi); Lukonzolwa; Mufumbi and Kalassa on the Luapula River (Bequaert Coll.).

Subulina mabilliana Bourguignat

Subulina mabilliana Bourguignat, 1883, Ann. Sc. Nat. Zool., (6) XV, p. 83, Pl. ix, figs. 68, 69 (type locality: Mt. Abouna Yusef, 4000 m., Abyssinia); 1889, Moll. Afr. Equator., p. 114. Pilsbry, 1906, Man. of Conch., (2) XVII, p. 85, Pl. xiv, fig. 56.

Rather common under stones, in the wooded parts of the peninsula Ubuari, on the west coast of Lake Tanganyika.

Subulina maringoensis Preston

Subulina maringoensis Preston, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 59, Pl. iv, fig. 3.

Type locality: Maringo Plateau, Belgian Congo (?Marungu).

Subulina normalis (Morelet)

Stenogyra normalis Morelet, 1885, Journ. de Conchyl., XXXIII, p. 24, Pl. ii, fig. 7 (type locality: Toumby near Landana).

Subulina normalis Morelet. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 82, Pl. xiii, fig. 25. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 36. Kwamouth (Bequaert Coll.).

Subulina pergracilis v. Martens

Subulina pergracilis E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 123, Pl. v, fig. 27. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 91, Pl. xiv, fig. 42.

Type locality: Bukende on the Semliki River (Stuhlmann Coll.).

Subulina perstriata v. Martens

Subulina perstriata E. v. Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 184; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 122, Pl. v, fig. 24. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 89, Pl. xiv, fig. 39. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 35.

Migere in Butumbi (type locality; Stuhlmann Coll.). Malema and Lukolela (Bequaert Coll.).

Subulina subangulata Putzeys

Subulina subangulata Putzeys, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lviii, fig. 9. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 84, Pl. xiii, fig. 23. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 36.

Nsendwe in the Manyema (type locality; Dupuis Coll.). Kisantu (Bequaert Coll.).

The following species probably occur in the Belgian Congo:

Subulina krebedjeensis Germain, 1907, Bull. Mus. Hist. Nat. Paris, pp. 65 and 348; 1908, in A. Chevalier, L'Afrique Centrale Française, pp. 490 and 615, Pl. v, fig. 17. Krebedje (or Fort Sibut, type locality); Beso (on the right bank of the Ubangi, 20 km. above Fort de Possel).

Subulina pinguis E. v. Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 185; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 121, Pl. v, fig. 18. Migere in Butumbi.

Subulina roccatii Pollonera, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 538, p. 2; 1909, Il Ruwenzori, Parte Scientif., I, p. 203, Pl. xx, fig. 6. Mobuku Valley at 2000 m., eastern slope of Mt. Ruwenzori. The figure of this species strongly suggests *Varicostele* rather than *Subulina*.

Subulina subcrenata E. v. Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 186; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 123, Pl. v, fig. 26. Migere in Butumbi.

SUBULINISCUS, new genus

The shell is subuliniform but with the apex subacute, the first whorl not depressed; embryonic whorls sculptured with spiral engraved lines. Columella distinctly truncate. Type: *Subulina ruwenzorensis* Pollonera.

In this group the summit is of the conoidal type, as in *Bocageia*, rather than of the globular, as in *Subulina, Tortaxis*, and *Homorus*. It differs from *Bocageia* by the spirally engraved embryonic whorls. Though these spirals are deeply bitten, they are very narrow, so that they are barely visible under an ordinary hand lens.

Krapfiella Preston[1] has the embryonic whorls sculptured with spiral striæ, but the summit is broad and obtuse, and the columella is not truncate.

66. **Subuliniscus ruwenzorensis** (Pollonera)

Plate XIX, Figures 8 to 10

Subulina ruwenzorensis Pollonera, 1907, Boll. Mus. Zool. Anat. Torino, XXII, No. 568, p. 1 (type locality: eastern slope of Mt. Ruwenzori, in the Mobuku Valley, at about 2000 m.); 1909, Il Ruwenzori, Parte Scientif., I, p. 203, Pl. xx, figs. 17 and 18; and var. *elongata* Pollonera, 1909, *op. cit.*, p. 203, Pl. xx, figs. 19 and 20. J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 206.

Mt. Ruwenzori: on the western slope in the *Erica* region of the Butagu Valley at 2800 m. (Schubotz Coll.).

Mt. Ruwenzori: western slope, in the Butagu Valley at 2000-2200 m., 10 specimens; also in the Lanuri Valley at 2000 m., 1 specimen (Bequaert Coll.).

The rather straightly conic, acute spire and the somewhat dull surface are characteristic. The color is olive-buff, sometimes dark olive-buff on the last whorl. A faint gray border may be seen below the suture on the spire, and in some specimens this becomes opaque white on the last two whorls. Under the microscope the first two whorls show engraved spiral lines, not very close, and the remaining whorls have a sculpture of extremely close, minute granules, in places arranged in waved spiral lines, over the low, irregular growth-wrinkles. In the neanic stage, the periphery is angular, but adults have the last whorl rounded. The columellar truncation is rather abrupt in the wider specimens, but oblique in the longer ones, which agree with Pollonera's var. *elongata*. The outer lip is thin.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
19.4 mm.	7.4 mm.	6.4 mm.	9⅓	Pl. XIX, fig. 10
20.3	6.0	6.7	9⅓	Pl. XIX, fig. 8

As the minute sculpture was not mentioned by Pollonera, it has seemed well to supplement his description, and to give figures of the adult stage (Pl. XIX, figs. 8 and 10) and the young, at 6.3 mm. long, of 5¾ whorls (Pl. XIX, fig. 9).

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[1] 1914, Ann. Mag. Nat. Hist., (8) VII, p. 472. Type: *K. mirabilis* Preston, Mt. Kenia.

67. **Subuliniscus lucasi,** new species

Luvunu near Masisi, at about 1800 m., type locality, 2 specimens; Mukule, 1800-2000 m., 2 specimens (Bequaert Coll.).

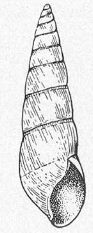

Fig. 51. *Subuliniscus lucasi*, new species.

The shell (Fig. 51) is imperforate, slender, with a long, straight-sided spire and relatively acute apex; tea-green at the base, becoming lighter tints of the same color on the spire. The surface is glossy, showing lightly marked growth-wrinkles under the hand-lens, but under the microscope a minute sculpture similar to that described for *S. ruwenzorensis* is seen. The whorls are very slightly convex, united by a linear suture which has a narrow gray border below. The aperture is rather strongly oblique. The columella is subvertical, obliquely truncate at the base, and very weakly sinuous in a profile view. Outer lip thin.

Length, 15.4 mm.; diameter, 4 mm.; length of aperture, 4.3 mm.; 9⅓ whorls.

A much more slender shell than *S. ruwenzorensis*, but like that in microscopic sculpture.

Named for Dr. F. A. Lucas, Director of The American Museum of Natural History.

PSEUDOGLESSULA O. Bœttger

Pseudoglessula O. Bœttger, 1892, Nachrichtsbl. D. Malak. Ges., XXIV, p. 202 (as a section of *Stenogyra*, with *Achatina calabarica* Pfeiffer, designated as type). Pilsbry, 1904, Man. of Conch., (2) XVII, p. 156 (monograph).

The essential structures of *Pseudoglessula* appear to be, in the shell, the strongly sculptured embryonic whorls, which are vertically ribbed, or netted by anastomosing ribs; in the genitalia, the simple penis with terminal retractor muscle inserted distally on the diaphragm, the narrow spermatheca on a very short duct; in the pallial organs, conspicuous maculation and sparse transverse venation of the outer wall of the lung, and a closed secondary ureter. Finally, the foot has pedal furrows resembling those of Zonitidæ, and terminates in a caudal pore.

Many species have characteristic microscopic sculpture, not often noticed in former descriptions, but of considerable value in specific discrimination.

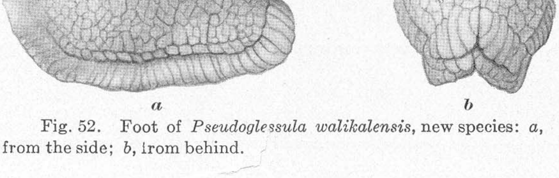

Fig. 52. Foot of *Pseudoglessula walikalensis*, new species: *a*, from the side; *b*, from behind.

The foot has been examined in *P. walikalensis* (Fig. 52), *P. umbilicata*, and *P. stuhlmanni*, all of which have pedal furrows with a vertically grooved fringe, also the caudal pore is more or less developed. These structures are best developed in *P. walikalensis* (Fig. 52) and are much less conspicuous in *P. stuhlmanni*.

Dupuis and Putzeys have given an outline figure of the living *P. humicola*, which evidently has a foot much like *walikalensis*.

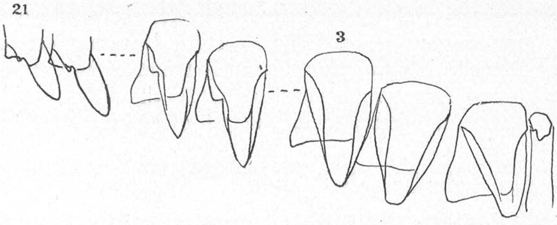

Fig. 53. Teeth of *Pseudoglessula walikalensis*, new species.

The dentition shows some variation. *P. walikalensis* (Fig. 53) has unicuspid inner lateral teeth, remarkable for the broadly overhanging lateral borders of the cusps. Outer cutting points appear on the outer laterals. The marginals have long, oblique mesocones and minute ectocones. The general appearance of the teeth is that of a zonitid or rapacious snail, though of course the radula is fundamentally achatinid.

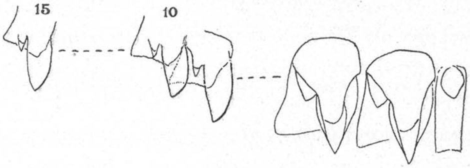

Fig. 54. Teeth of *Pseudoglessula umbilicata*, new species.

In *P. umbilicata* (Fig. 54) the inner lateral teeth have well-developed ectocones, though the cutting points do not rise from distinct cusps. The outer laterals and the marginals have small outer cusps and long mesocones, as in *P. walikalensis*.

The jaw is rather thin, finely striate vertically, in both species examined.

The venation of the lung is faint and transverse in *P. walikalensis*. The outer wall of the lung is maculate in all species observed.

It will be seen that, while there is considerable difference between the lateral teeth in these species, they agree in the unusually broad lateral expansion of the mesocones.

The most remarkable characters of the genus are the presence of pedal furrows and a caudal pore, strongly developed in some species, quite weakly so in others.

Key to the Subdivisions of *Pseudoglessula*

1. Embryonic whorls vertically straight- or curved-ribbed ....2.
Embryonic whorls having a netted pattern; columella truncate.
Dictyoglessula, new subgenus.
Type, *P. retifera* v. Martens.[1]

2. Shell slender, *Subulina*-shaped; columella truncate.
Ischnoglessula, new subgenus.
Type, *P. subfuscidula*, new species.
Shell oblong-conic..3.

3. Columella distinctly truncate at base......Subgenus *Pseudoglessula*, proper.
Type, *P. calabarica* (Pfeiffer).
Columella not truncate, curving into the basal margin; perforate or umbilicate.
Subgenus *Kempioconcha* Preston.
Type, *P. kivuensis* (Preston).

Subgenus **PSEUDOGLESSULA,** proper

68. **Pseudoglessula walikalensis,** new species

Plate XVIII, Figures 1 and 1*a*

Walikale, 1 specimen (Bequaert Coll.).

The shell is imperforate, ovate-conic, thin, olive-lake colored. The surface is glossy. The summit is rounded, obtuse, the first whorl being depressed, smooth at first, then radially ribbed; on the following whorl the ribs become closer, and they are still closer from the third whorl on, being equal to the interstices. On the last whorl they weaken somewhat at the periphery, but not conspicuously. There is also a microscopic, very close but weak sculpture of spiral impressed lines. The whorls are rather weakly convex, the suture well impressed. The aperture is ovate, slightly oblique, with a slightly vinaceous tint within. The columella is straight, short, nearly vertical, terminating in an obliquely excised white fold. The thin outer lip is very narrowly expanded.

Length, 28.5 mm.; diameter, 13.4 mm.; length of aperture, 13 mm.; 6⅔ whorls.

The unusually obtuse summit, strongly excised columellar border, and the microscopic sculpture are distinguishing characters of this species. Notes on the dentition (Fig. 53) and foot (Fig. 52) have been given above.

Genitalia (Fig. 55). The cavity of the very long penis is nearly filled by three large longitudinal ridges and one small one, all densely papillose. The distal fifth is smaller, without ridges, and is evidently an epiphallus. The vas deferens is inserted about 2.7 mm. from the end, and the short, stout retractor muscle is terminal. The vagina is very large, muscular, internally ribbed. The spermatheca is cylindric, closely bound to the lower part of the uterus (but shown dissected out in the figure). The right ocular retractor muscle crosses the penis as usual.

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[1] This subgenus includes also *P. heteracra* Bœttger and *P. sjöstedti* d'Ailly.

Length of penis, 23 mm.; length of vagina, 6 mm.; length of spermatheca and duct, 6.3 mm.

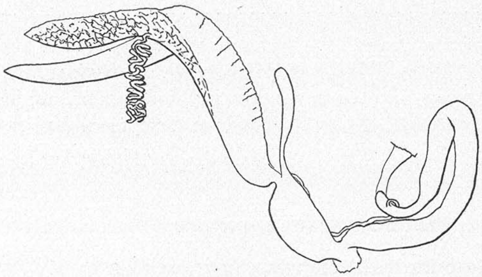

Fig. 55. Genitalia of *Pseudoglessula walikalensis*, new species.

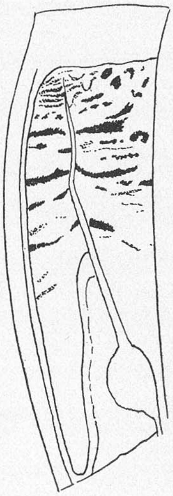

Fig. 56. Lung of *Pseudoglessula walikalensis*, new species.

The lung (Fig. 56) is striped and maculate with black on a gray ground. There is but little macroscopic venation. The kidney is more than twice as long as the pericardium. The secondary ureter appears to be a closed tube throughout.

Length of lung, 20 mm.; length of kidney, 13 mm.; length of pericardium, 5 mm.

Pseudoglessula intermedia Thiele

Pseudoglessula intermedia J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 207, Pl. v, figs. 46 and 46*a*.
Type locality: Island Kwidjwi (Schubotz Coll.).

69. **Pseudoglessula intermedia masisiensis,** new subspecies

Plate XVIII, Figures 2 and 2*a*

Near Masisi: Mbisi, type locality, 3 specimens; and Mokoto, 1 specimen. Mukule, at 1800-2000 m., 4 specimens (Bequaert Coll.).

The shell is imperforate, ovate-conic, between tawny and russet, paler on the spire (but in slightly faded shells more of an old gold color). Initial 1⅔ whorls have rather widely spaced ribs with irregular spiral striæ in the intervals; after which the ribs rapidly become closer, crowded rib-striæ, equal to the intervals. On the last whorl they are strongest in the upper part, weakening at and below the periphery, though continuing to the base. There is a microscopic sculpture of criss-cross scratches. The early whorls are quite convex, the later but weakly so. The aperture is nearly vertical, ovate, hydrangea pink within. The columella, of the same color, is subvertical above, terminating below in a prominence followed by an oblique truncation. The outer lip is expanded, and distinctly though very narrowly reflected.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
35.5 mm.	15.5 mm.	15.2 mm.	7½	Type
35.5	14.8	14.5	7½	

This form closely resembles *P. intermedia* from Kwidjwi Island in Lake Kivu, but it is somewhat larger and has a narrowly reflected lip—a structure neither described or figured for Thiele's species. By its microscopic sculpture *P. i. masisiensis* resembles *P. humicola* Dupuis and Putzeys. Thiele states that such sculpture is "*nicht deutlich wahrzunehmen*" in his species. Yet he may not have used the microscope, and an ordinary pocket lens does not bring out the criss-cross scratches in *masisiensis*. Under the circumstances, it is probably best to rank the Masisi form as a subspecies of that from Kwidjwi Island until a direct comparison can be made.

70. **Pseudoglessula humicola** Dupuis and Putzeys

Pseudoglessula humicola DUPUIS AND PUTZEYS, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. xxxv, figs. 3-6 (spelled "*P. hermicola*" in the Zoological Record). PILSBRY, 1905, Man. of Conch., (2) XVII, p. 163, Pl. XLVII, figs. 35 and 36.

Type locality: Nsendwe (Dupuis Coll.).

Ituri forest: Avakubi, 2 immature specimens (Bequaert Coll.).

In this species, the rib-sculpture becomes obsolete on the later whorls and there is a very beautiful microscopic granulation produced by criss-cross incised lines. The columella is not truncate basally, but is encircled by a small lamella. As the larger specimen taken by Bequaert is only half grown, the identification is not quite positive. The apex is more obtuse than in the original figures, but otherwise there is entire agreement.

This species belongs to a particular group of *Pseudoglessula* somewhat intermediate between the typical group and *Kempioconcha*. *Bulimus boivini* Morelet,[1] of which I have examined specimens, and *B. ptychaxis* Smith appear to belong to this group of *Pseudoglessula*. Recent authors have placed them in *Buliminus* or *Ena*.

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[1] See Germain, 1916, Bull. Mus. Hist. Nat. Paris, p. 252 for synonymy and distribution; also E. A Smith, 1899, Proc. Zool. Soc. London, p. 587.

Subgenus **Kempioconcha** Preston

Kempia Preston, 1913, Rev. Zool. Afric., III, p. 53. Type: *K. kivuensis* Preston (preoccupied in Aves).
Kempioconcha Preston, 1913, *op. cit.*, p. 212. Substitute for *Kempia.*

Pseudoglessulæ in which the columella passes into the basal margin in a curve, and is not truncate or plicate; the columellar edge being free, dilated, and exposing a small umbilicus; apical sculpture typical.

The bulimoid aperture, in this group, has caused one species to be described as a *Pseudopeas*, others as *Bulimini;* yet the other features of the shell, including the characteristic embryonie whorls, show the relationship to *Pseudoglessula.* There are also several species, such as *Pseudoglessula boivini* (Morelet), which form a transition to the typical group. The soft anatomy, which I have examined in *P. stuhlmanni*, does not differ from *Pseudoglessula.*

Throughout the Achatinidæ we encounter, here and there, groups which have lost the truncation of the columella. *Kempioconcha* is only another instance of this transformation of the achatinoid to the bulimoid columella.

71. **Pseudoglessula (Kempioconcha) leopoldvillensis,** new species

Plate XVIII, Figure 3

Leopoldville, 12 specimens (Bequaert Coll.).

The shell is compressed-umbilicate, turrite-conic, rather fragile, isabella color. The first whorl is high, depressed at the tip; first two whorls having coarse oblique ribs. On the following whorl the ribs are far smaller and about half as far apart. The post-nuclear whorls are finely rib-striate; on the ventral face of the last whorl there are about seven striæ in a millimeter. Over all is a microscopic sculpture of diagonal lines, like a woven material. A faintly expressed cord or appearance of angulation marks the periphery, the riblets becoming very weak or subobsolete below it, on the ventral side, but continuous over the last half of the base. The aperture is somewhat oblique. The columellar margin is dilated and reflected around the umbilicus. There is no truncation or excision at its base. The outer lip is thin, the edge a trifle expanding.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
18.0 mm.	7.4 mm.	6.7 mm.	7
16.3	7.1	6.0	6 ¾

It is between *P. umbilicata* and *P. stuhlmanni* in size, but most like the former in shape. The high, almost angular, and coarsely ribbed nuclear whorls of *P. leopoldvillensis* are a distinctive feature.

72. **Pseudoglessula (Kempioconcha) umbilicata,** new species

Plate XVIII, Figure 5

Rutshuru, in the forest gallery of the Rutshuru River, 7 specimens (Bequaert Coll.).

The shell is thin, umbilicate, oblong-conic, between honey-yellow and isabella color, glossy. Initial half whorl smooth, the next 1½ sculptured with oblique riblets, which are slightly more spaced than the rib-striæ of the succeeding whorls. On the last whorl the rib-striæ abruptly become weaker and in part effaced at and below the periphery, which is very indistinctly subangular in front of the aperture. The lateral outlines of the spire are straight, the summit obtuse, the whorls moderately convex. The aperture is oblique, ovate. The columella is vertical, not thickened, indistinctly excavated at the base; the columellar lip being reflected. The outer lip is thin, the edge smooth and very slightly expanded.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
22.0 mm.	9.7 mm.	7.9 mm.	7⅓	Type
22.7	9.5	8.3	7½	

This species is well characterized by the umbilicus and the very weak truncation of the columella. Some other species are perforate or rimate, but so far as I know no other species is distinctly umbilicate. The riblets on the embryonic whorls are slightly more oblique than those upon succeeding whorls. The intervals between the ribs have a delicate woven texture of criss-cross impressed lines, as in the related species, but it is very little impressed, and in places hardly to be seen on adult shells. The rib-striæ become somewhat irregular on the last whorl. In different places on the ventral face, one may count from two to five in a millimeter.

The egg is white, densely and very irregularly granose, and measures 1.6 × 2 mm.

The tail is rounded above, with an impressed median line, an inconspicuous caudal pore, and there are rather weak pedal grooves above the lateral margins of the foot.

73. **Pseudoglessula (Kempioconcha) stuhlmanni** (v. Martens)

Buliminus stuhlmanni E. v. MARTENS, 1895, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 128; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 63, Pl. III, figs. 26 and 29. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 21.

Semliki Valley: Karevia, 1175 m. at the western foot of Mt. Ruwenzori (type locality), Bukende, Bugundi (Orani), and Ongenya (Stuhlmann Coll.). Kisantu, Lukolela, Vieux Kassongo, Lukonzolwa (Bequaert Coll.). Also recorded from Manyonyo in Uganda.

Ituri Forest: Avakubi, 5 specimens; and Penge, 23 specimens. Semliki Forest: Moho near Lesse, 2 specimens. Beni, in a forest gallery, 1 specimen (Bequaert Coll.).

On account of its entire columella, von Martens placed this species in *Buliminus*, though with some suspicion that it belonged to *Pseudoglessula*. I have been able to verify this suspicion by the dissection of one of Bequaert's specimens. It has the characteristic genitalia, maculate lung-wall, and dentition of *Pseudoglessula*. The penis (which in *Buliminus* should have a long appendix) is simple, thick, with terminal retractor muscle inserted on the diaphragm, and a subterminal vas deferens (Fig. 57).

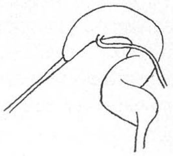
Fig. 57. Penis of *Pseudoglessula stuhlmanni* (v. Martens).

The striæ, as shown in von Martens' figure, are too oblique. Under the microscope the striæ, and especially the intervals, are criss-crossed with impressed diagonal lines. It is rather variable in size. The type measurements are given as: length, 11 mm.; diameter, 5 mm.; aperture, 4 mm.; 6 whorls. Specimens measure:

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
12.4 mm.	5.8 mm.	4.6 mm.	6½	Penge
12.5	5.9	4.4	6¾	Penge
10.0	4.8	3.5	6¼	Beni
9.0	4.5	3.4	5¾	Moho (Lesse)

74. **Pseudoglessula (Kempioconcha) hessei** (C. Bœttger)

Plate XVIII, Figure 4

Pseudopeas hessei C. R. Bœttger, 1913, Ann. Soc. Malacol. Belgique, XLVII, (1912), p. 96, Pl. ii, fig. 3.

Type locality: Netona (Povo Netonna) on the Banana Creek (Hesse Coll.).

Zambi, 50 specimens (Lang and Chapin, and Bequaert Coll.).

The shell is light brown, between cinnamon and cinnamon-buff or sometimes nearly white. The first whorl is very convex above, the tip sunken. Except at the tip, it has strong, slightly retractive riblets. On the second whorl they are more oblique and more spaced than on the third. There is an inconspicuous peripheral cord on the last whorl, below which the costulation is weaker in front of the aperture, but not on the rest of the base. On the face of the last whorl there are five striæ in one millimeter. The intervals are marked with diagonal lines in criss-cross. The outer lip is just mentionably expanded. The columella is vertical, but in profile view a very slight excavation may be observed where it passes into the basal lip. The columellar edge is built forward and dilated, leaving an umbilical perforation and crevice shaped like a reversed comma.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
14.3 mm.	5.9 mm.	4.8 mm.	7½
12.3	5.5	4.5	6¾

As Bœttger did not describe the sculpture of the embryonic whorls, and his gelatine print from a photograph shows no details, new figures are now given. *Pseudopeas,* in which this species was originally placed, has spirally striate embryonic whorls, and is an entirely different thing. *Pseudoglessula stuhlmanni* (v. Martens) is the most nearly related species. It is somewhat smaller, with the umbilicus less dilated at the last whorl, but the two species are very much alike.

ISCHNOGLESSULA, new subgenus

In this group the microscopic sculpture, when present, consists of most minute granules in spiral series.

Type: *Pseudoglessula subfuscidula,* new species.

75. **Pseudoglessula (Ischnoglessula) subfuscidula,** new species

Plate XVIII, Figure 8

Ituri Forest: Penge, type locality, 14 specimens; and Avakubi, 1 specimen. Semliki Forest: Lesse, 1 specimen. Rutshuru, in the forest gallery of the Rutshuru River, 7 specimens. Walikale, 1 specimen (Bequaert Coll.).

The shell is imperforate, subulate, the outlines contracted near the summit, dark olive-buff with rather indistinct brown streaks at wide, unequal intervals; brilliantly glossy. The summit is rounded, the initial third of the first whorl rather prominent and smooth, the next two whorls are regularly ribbed, the ribs straight, vertical, about half as wide as their intervals. Subsequent whorls have stouter, somewhat oblique ribs. On the last three whorls they become somewhat unequal and unevenly spaced, and on the last whorl part of them are very weak or obsolete, and do not continue upon the base. The whorls are rather convex, and the last has a low, cord-like keel defining the base, which is weakly convex. In most specimens this keel may be seen above the last turn or two of the suture. The aperture is very slightly oblique, trapezoidal. The columella is white, somewhat concave, abruptly truncate at the base. The outer lip is thin, acute.

Length, 10.5 mm.; diameter, 3 mm.; length of aperture, 2.6 mm.; number of whorls, 9⅓.

This species appears to be closely related to *P. fuscidula* (Morelet),[1] found from Gaboon and Kamerun to Liberia. It has not the silky luster ascribed to that species, and the details of sculpture differ, according to the accounts of *P. fuscidula* given by d'Ailly and Germain.

Under the compound microscope, an extremely minute and low granulation may be seen in *subfuscidula*, but it is so weak that the surface remains glossy or glittering, unlike *P. fuscidula.* Morelet says of *P. fuscidula* that "elle est revêtue d'un épiderme d'un brun foncé, très mince, sans éclat, tirant sur le verdâtre; le test, sous cette enveloppe, est brillant, transparent, cristallin."

P. lemairei Dautzenberg and Germain[2] has some resemblance to this species, but it is much larger, the last whorl is subangular, and it has not the bright gloss of *subfuscidula.* According to the description of *lemairei*, the first two whorls are smooth, but an immature specimen (paratype) sent by Dautzenberg shows the first two whorls distinctly ribbed.

76. **Pseudoglessula (Ischnoglessula) famelica,** new species

Plate XVIII, Figure 6

Ituri Forest: Penge, 2 specimens (Bequaert Coll.).

The shell is imperforate, subulate, clove-brown, glossy, resembling *P. subfuscidula*, from which it differs as follows: the form is far more slender; the rib-striæ of the first whorl are finer; those of the later whorls are strong and regular, and continue over the base where they grow weaker towards the axis.

Length, 8 mm.; diameter, 2 mm.; length of aperture, 1.6 mm.; 9½ whorls.

The microscopic granulation is like that of *P. subfuscidula.* Except that it is distinctly narrower, *P. famelica* appears to stand close to *P. minuscula* Preston,[3] described from two hundred miles east of Loanda, Angola.

77. **Pseudoglessula (Ischnoglessula) cruda,** new species

Plate XVIII, Figure 9

Ituri Forest: Penge, type locality, 15 specimens (Bequaert Coll.); Medje, 3 specimens (Lang and Chapin Coll.). Semliki Forest: Lesse, 15 specimens (Bequaert Coll.). Rutshuru, in the forest gallery of the Rutshuru River, 10 specimens (Bequaert Coll.).

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[1] 1885, Séries Conchyliologiques, I, p. 26, Pl. I, fig. 9. Pilsbry, 1905, Man. of Conch., (2) XVII, p. 160. Germain, 1911, Bull. Mus. Hist. Nat. Paris, p. 237.

[2] 1914, Rev. Zool. Afric., IV, p. 35, Pl. IV, figs. 17 and 18.

[3] 1910, Proc. Malac. Soc. London, IX, p. 54, fig. on p. 55.

The shell is imperforate, turrited, thin, clay color, with broad streaks of lighter tint and darker shades, and narrow, unevenly spaced sepia streaks. The surface is dull, with sculpture of rather close oblique, slightly curved riblets, about one-fourth to one-sixth as wide as the intervals; on the embryonic whorls the riblets are equally strong and distinctly more widely spaced. Under the compound microscope the surface shows a very minute granulation, in places running into longitudinal striolation. The whorls are rather strongly convex, the last having a delicate keel below the middle, defining the base, which is flattened and radially striate, not ribbed. The aperture is somewhat oblique, rhombic. The columella is concave, thin, abruptly truncate, a deep bay below it.

Length, 10.3 mm.; diameter, 3.3 mm.; length of aperture, 2.7 mm.; 8½ whorls.

The species is stouter than *P. fuscidula* and differs further by the streaked coloring and closer ribs. It is duller than *P. subfuscidula*, with more ribs which are more regular, and the microscopic granulation is more pronounced.

Another closely related species is *P. lemairei* Dautzenberg and Germain, of which I have been able to compare an immature paratype. It appears from this that the ribs are more spaced in *lemairei;* moreover, in the adult stage they become weak on the last whorl according to the description and figures. In *P. cruda* they continue fine and sharp throughout, in numerous specimens examined.

The dull surface appears to be common to *P. fuscidula*, *P. lemairei*, and *P. cruda*.

78. **Pseudoglessula (Ischnoglessula) gracillima,** new species

Plate XVIII, Figure 7 and *7a*

Ituri Forest: Medje, type locality, 9 specimens (Lang and Chapin Coll.); Avakubi (Bequaert Coll.).

The shell is very long, slender, isabella colored, with some indistinct darker streaks. The summit is subacute, the initial whorl being elevated, conic. First half whorl smooth, the subsequent whorls rib-striate, the riblets becoming finer and closer on the second and third whorls. The embryonic stage seems to include 3½ whorls. After that, the riblets are slightly more oblique. On the last whorl they weaken in the middle and the base is merely striate; it is defined by a spiral thread running from the termination of the suture. In places this thread may be seen close above the suture, on the spire. The whorls are convex, the suture nearly even. The aperture is oval, angular at the ends. Columella nearly vertical, curving into the parietal wall, and abruptly truncate very close to the base.

Length, 14.6 mm.; diameter, 2.7 mm.; length of aperture, 2.8 mm.; 11 whorls.

By the general contour, this should be a *Subulina;* yet it differs by the shape of the summit, and there is a trifling change in the sculpture which appears to indicate a long embryonic shell, as in *Homorus*. The generic reference must be accepted as provisional, pending an appeal to the anatomical structure. The specimens were preserved dry.

Two of the shells from Avakubi are similar to those from Medje, but with them are two other wider ones, not quite mature, which for the present may be referred to the same species. One measures: length, 13.5 mm.; diameter, 3.5 mm.; 9½ whorls.

Other Species of *Pseudoglessula* Recorded from the Belgian Congo

Pseudoglessula boivini (Morelet)

Glandina boivini Morelet, 1860, Séries Conchyl., II, p. 72, Pl. v, fig. 5 (type locality: Mombasa).

Buliminus boivini Morelet. E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 61. E. A. Smith, 1899, Proc. Zool. Soc. London, p. 587. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 20. Germain, 1916, Bull. Mus. Hist. Nat. Paris, p. 252.

Bulimus (Cerastus) mamboiensis E. A. Smith, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 153, Pl. v, fig. 7.

Malema, Kakombo (between Ankoro and Kikondja), Niemba Kunda (near Kiambi), Bukama, Lukonzolwa (Bequaert Coll.).

Germain, 1916, gives the general distribution of this species as follows: Zanzibar Island, German and British East Africa, along the East African coast from Mombasa to Lourenzo Marques, Eastern Zululand, Nyasaland, Katanga district in the Belgian Congo.[1] Malema (near Bumba, 2° N. lat., 22° 45′ E. long.) is the westernmost locality known.

Pseudoglessula burungaensis (Preston)

Kempia burungaensis Preston, 1913, Rev. Zool. Afric., III, p. 53, Pl. vi, fig. 2.

Type locality: Burunga at the foot of Mt. Mikeno, 6000 feet (Kemp Coll.).

Pseudoglessula diaphana Dupuis and Putzeys

Pseudoglessula diaphana Dupuis and Putzeys, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. xxxvi, figs. 7 and 8. Pilsbry, 1905, Man. of Conch., (2) XVII, p. 164, Pl. lvii, figs. 38 and 39 (copy of description and figures).

Type locality: Nsendwe (Dupuis Coll.).

Pseudoglessula elatior Thiele

Pseudoglessula elatior J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 207, Pl. v, figs. 47 and 47*a*.

Type locality: Island Kwidjwi (Schubotz Coll.).

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[1] The Belgian Congo localities recorded by Germain are the same where I collected this species on my 1910-12 trip; their number has been unreasonably increased through various errors: Kalombo and Kakompo are misprints for Kakombo; Niemba Kunda is one single locality. This snail was not collected at the places Kiambo (misprint for Kiambi) and Katanga [J. B.].

Pseudoglessula gracilior E. A. Smith

Pseudoglessula gracilior E. A. Smith, 1904, Proc. Malacol. Soc. London, VI, p. 69, fig. III (type locality: Ukami, German East Africa). Pilsbry, 1905, Man. of Conch., (2) XVII, p. 167, Pl. lxi, fig. 92. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 34.

Kapoya (between Kiambi and Sampwe; Bequaert Coll.).

Pseudoglessula lemairei Dautzenberg and Germain

Pseudoglessula lemairei Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 35, Pl. iv, figs. 17 and 18.

Type locality: Lukonzolwa (Bequaert Coll.).

Pseudoglessula nseudweensis Putzeys

Pseudoglessula nseudweensis Putzeys, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lvii, fig. 7.

Pseudoglessula nsendweensis Dupuis and Putzeys, 1900, p. xix of their reprint from Bull. Séances Soc. Malacol. Belgique; this correction has not been published in the periodical itself.

Type locality: Nsendwe (Dupuis Coll.).

Pseudoglessula phæa Putzeys

Pseudoglessula phæa Putzeys, 1898, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIII, p. xcii, fig. 22. Pilsbry, 1905, Man. of Conch., (2) XVII, p. 162, Pl. liii, fig. 31.

Type locality: forest of the Warega in the Manyema country (Dupuis Coll.).

Pseudoglessula ptychaxis (E. A. Smith)

Bulimus (*Buliminus*) *ptychaxis* E. A. Smith, 1880, Proc. Zool. Soc. London, p. 346, Pl. xxxi, fig. 3 (type locality: Ujiji on the eastern shore of Lake Tanganyika); 1890, Ann. Mag. Nat. Hist., (6) VI, p. 147. Pelseneer, 1886, Bull. Mus. Hist. Nat. Belgique, IV, p. 104.

Bulimus boivini var. *ptychaxis* Smith. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 21.

Pseudoglessula ptychaxis Smith, var. Kobelt, 1913, Revue Suisse Zool., XXI, p. 72, Pl. ii, figs. 10 and 10*a*.

Mufumbi (along the Luapula River, 11° S. lat.) and Elisabethville (Bequaert Coll.).

Pseudoglessula strigosa (Morelet)

Achatina strigosa A. Morelet, 1866, Journ. de Conchyl., XIV, p. 160 (type locality: Mt. Cungulangulo in the district Golungo Alto, Angola); 1868, Voy. Welwitsch, Moll. terr. fluv., p. 78, Pl. ix, fig. 2.

Pseudoglessula strigosa Morelet. Pilsbry, 1905, Man. of Conch., (2) XVII, p. 161, Pl. lxi, fig. 13. C. R. Bœttger, 1913, Ann. Soc. Malacol. Belgique, XLVII, (1912), p. 96.

Netona on the Banana Creek (Hesse Coll.).

The following species probably occur within the limits of the Belgian Congo:

Pseudoglessula kivuensis (Preston) = *Kempia kivuensis* PRESTON, 1913, Rev. Zool. Afric., III, p. 53, Pl. VI, fig. 3; not Pl. IV, fig. 3 as printed in the text. *Kempioconcha kivuensis* PRESTON, 1913, *op. cit.*, p. 212. Near Lake Kivu.[1]

Pseudoglessula obtusata J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 206, Pl. V, figs. 45 and 45*a*. Rugege Forest, 1800 m.

PSEUDOPEAS Putzeys

Pseudopeas PUTZEYS, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lviii, for *P. pulchellum* Putzeys, *P. scalariforme* Putzeys, and *Subulina isseli* Jickeli. PILSBRY, 1906, Man. of Conch., (2) XVIII, pp. 114 and 216 (monograph).

Beccaria BOURGUIGNAT, 1883, Ann. Sc. Nat. Zool., (6) XV, p. 119. Type: *Subulina isseli* Jickeli (preoccupied by *Beccaria* Trinchese, 1870).

The shell is similar to *Opeas* except that the embryonic whorls are finely striate spirally. The type is *P. pulchellum* Putzeys, as designated by me in 1906.

The genus was first defined by Bourguignat under the preoccupied name *Beccaria*. He recognized the special feature mentioned above. Subsequently Putzeys proposed *Pseudopeas* as a subgenus for ribbed *Opeas*, not noticing the embryonic sculpture. In 1906, the present writer enlarged the group by including additional African species, with others from South America and from the old fauna of western Australia.

The African species are oviparous; the egg capsules large, globular, as in *Opeas*.

79. **Pseudopeas plebeium** (Morelet)

Stenogyra plebeia MORELET, 1885, Journ. de Conchyl., XXXIII, p. 27, Pl. II, fig. 2 (type locality: Landana).

Pseudopeas plebeium Morelet. PILSBRY, 1906, Man. of Conch., (2) XVIII, p. 116, Pl. XXV, figs. 5-8.

Zambi, 1 specimen (Lang and Chapin Coll.).

80. **Pseudopeas thysvillense**, new species

Plate XX, Figure 7

Thysville, type locality, in a cave, 10 specimens (Bequaert Coll.); Zambi, 1 specimen (Lang and Chapin Coll.).

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[1] *Ena kivuensis* Preston, 1913, Rev. Zool. Afric., III, p. 50, Pl. VI, fig. 1, from Kisenje (on Lake Kivu), is probably also a *Pseudoglessula*, since the author compares it with *Glandina boivini* Morelet.

The shell is openly perforate, long, turrited, olive-buff, somewhat shining. First 1½ whorls have a rather rude sculpture of low vertical striæ crossed by low, ill-developed spiral threads, producing a grating. Subsequent whorls have subvertical riblets, with some indistinct striæ in the intervals. On the face of the last whorl, 8 riblets may be counted in 1 millimeter. The whorls are all strongly convex, the suture very deeply impressed. The aperture is long-ovate, columella vertical, its edge rather broadly reflected. The thin outer lip arches forward rather strongly in the upper half.

Length, 6.4 mm.; diameter, 2.2 mm.; length of aperture, 1.9 mm.; 7 whorls.

The sculpture of the embryonic whorls is rather rough, low, and far coarser than in *P. saxatile.* The later whorls are similar in sculpture to *P. pulchellum* and *P. scalariforme* of the Upper Congo (Nsendwe, zone of Manyema); but both of these are described as imperforate. The second also differs in shape of the columella. The strong riblets of *P. thysvillense* separate it from *P. saxatile* (Morelet) and *plebeium* (Morelet).

81. **Pseudopeas saxatile** (Morelet)

Stenogyra saxatilis MORELET, 1885, Journ. de Conchyl., XXXIII, p. 27, Pl. II, fig. 1 (type locality: Landana).

Pseudopeas saxatile Morelet. PILSBRY, 1906, Man. of Conch., (2) XVIII, p. 115, Pl. XXV, figs. 1-4. GERMAIN, 1908, Journ. de Conchyl., LVI, p. 102, Pl. III, figs. 5 and 6. Soubré on the Sassandra River, Ivory Coast.

Stanleyville, several hundred specimens (Lang and Chapin Coll.).

"They were found, with two other species [*Subulina angustior* (Dohrn) and *Streptostele horei* Smith], on the foundation stones of houses in the station, where short grass, rather matted near the ground, was growing and the rain-water from the roof provided an abundance of moisture. Sometimes they occur in grass partly imbedded in soil, and as many as five or six have been taken together" [H. L.].

These examples differ from *P. saxatile* (Morelet) of the West Coast, figured by the writer in 1906, by the smaller size and by the less lengthened whorls. The embryonic whorls are spirally striated to the apex but the striation is rather weaker than in *saxatile* compared. There is a very minute crenulation of the suture. The later whorls have small, low, curved folds mingled with irregular striæ. In some places, spiral impressed lines are weakly traced. Over all there is a weak microscopic granulation. The axis is minutely perforate. The usual length is 6 to 6.5 mm., but the largest specimen measures:

Length, 8 mm.; diameter, 2.6 mm.; length of aperture, 2.4 mm.; 7 whorls.

82. **Pseudopeas curvelliforme,** new species

Plate XX, Figures 8 and 8*a*

Rutshuru, in the forest gallery along the Rutshuru River, type locality, 10 specimens; Penge, 5 specimens and Avakubi, 10 specimens (Bequaert Coll.). Medje, 3 specimens (Lang and Chapin Coll.).

The shell is perforate, turrite-conic, thin, dark olive-buff (old specimens speckled with buff); the surface somewhat dull or with but little gloss. The first whorl is high, but with the tip turned down; the first two whorls distinctly and closely sculptured with fine, thread-like striæ. Low, curved, unequal wrinkles along the lines of growth appear on the third whorl; over them an extremely fine striation in the same direction, and over all a microscopic granulation. The whorls are rather convex; suture well impressed. The aperture is trapezoidal-piriform. The thin outer lip arches strongly forward in the upper third, retracting below and to the suture. The columella is vertical, straight, its edge reflected, leaving a narrow umbilical perforation.

Length, 7.75 mm.; diameter, 3 mm.; length of aperture, 2.75 mm.; 6⅓ whorls.

The strongly curved outer lip might influence conchologists who do not use a microscope to locate this species in the genus *Curvella;* yet I do not find any described species in that genus quite like it. The sculpture of the apical whorls, as well as their shape, show it to be *Pseudopeas.* I have not seen *Hapalus ovatus* Putzeys, a shell of somewhat similar shape with the sculpture of the nucleus undescribed.

The largest individual, one from Penge, is 8.3 mm. long, of 6½ whorls.

Another species of *Pseudopeas* is represented by a single specimen, perhaps not mature, taken at Rutshuru by Bequaert.

Other Species of *Pseudopeas* Recorded from the Belgian Congo

Pseudopeas pulchellum Putzeys

Pseudopeas pulchellum Putzeys, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lix, fig. 11. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 118, Pl. xxv, fig. 13.

Type locality: Nsendwe (Dupuis Coll.).

Pseudopeas scalariforme Putzeys

Pseudopeas scalariforme Putzeys, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lix, figs. 12 and 13. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 118, Pl. xxv, figs. 9 and 10.

Type locality: Nsendwe (Dupuis Coll.).

Opeas Albers

Opeas Albers, 1850, Die Heliceen, p. 175. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 122 (monograph).

Type: *Bulimus gracilis* Hutton (=*Achatina subula* Pfeiffer).

Shell small, thin, turrite, usually perforate, with large, obtuse, rounded apex and convex or flattened whorls; corneous or yellowish. Embryonic whorls smooth. Aperture small, ovate, the outer lip thin, usually arched forward; columella straight or concave, not sinuous, the columellar lip reflexed, curving into the basal lip and not toothed or truncate below. Oviparous, the egg capsules large and spheroidal.

This genus is found in the tropical regions of both hemispheres, some of the species spreading into subtropical countries.

Opeas is of rare occurrence in the Congo Basin, judging from the published records and the specimens collected. A few species have been described from Gaboon and Angola. It appears to be more abundant in East Africa, yet all of the tropical African species require renewed scrutiny to determine whether part of them may not belong to *Pseudopeas* or to *Streptostele*.

83. **Opeas gracile** (Hutton)

Bulimus gracilis Hutton, 1834, Journ. Asiat. Soc. Bengal, III, pp. 84 and 93 (type locality: Mirzapur, India).

Achatina subula Pfeiffer, 1839, Wiegmann's Arch. f. Naturgesch., I, p. 352 (type locality: Havana, Cuba).

Opeas gracile Hutton. O. Bœttger, 1891, Ber. Senckenberg. Naturf. Ges. Frankfurt a. M., p. 272. Pilsbry, 1906, Man. of Conch., (2) XVIII, pp. 125 and 198, Pl. xviii, figs. 3-6; Pl. xxviii, fig. 70.

Malela, 40 specimens (Bequaert, Lang and Chapin Coll.).

The largest of these specimens are 8.2 mm. long, of 7 whorls.

Very common throughout the Oriental Region and in tropical America, whence it has been spread by man in various directions: it passes into Polynesia, Formosa, and Japan, reaching westward Aden, British East Africa, and the Mascarene Islands. It is found in Southern Mexico, throughout the West Indies, Central America, and South America as far as Para and Guayaquil.

This species has been widely scattered by commerce, but the only other African locality I know of is Takaungu on the coast of British East Africa, 3° 42′ S. lat., whence specimens were sent me some years years ago by Sir Charles Eliot.

Other Species of *Opeas* Recorded from the Belgian Congo

Opeas venustum (E. A. Smith)

Opeas venustum E. A. Smith, 1903, Journ. of Conch., X, p. 319, Pl. iv, fig. 21 (type locality: eastern Uganda). Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 146, Pl. xv, fig. 69. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 37. Bukama and Kikondja (Bequaert Coll.).

Curvella Chaper

Hapalus Albers, 1850, Die Heliceen, p. 140 (not *Hapalus* Billberg, 1820, Coleoptera).
Curvella Chaper, 1885, Bull. Soc. Zool. France, X, pp. 48 and 49. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 46 (monograph).
Type: *Curvella sulcata* Chaper.

Shell oblong-conic, perforate or imperforate, thin, translucent, covered with a thin, pale cuticle; growth-lines strongly arcuate. Apical whorl obtuse, rounded and smooth. Aperture ovate, the outer lip acute, arching forward in the middle, retracted at suture and base; columella slightly sinuous or straight, curving into the basal margin. Central tooth of the radula narrow, laterals tricuspid.

The first whorl, or a little more, is smooth; the following whorl is sculptured with close vertical striæ, after which the striæ or grooves become protractive below the suture.

Some species approach *Opeas* and *Pseudopeas* rather closely, but the more broadly conic shape of *Curvella* and its strongly sinuous lip, in addition to the characters given above, are rather characteristic of the genus. The columella, too, is frequently sinuous.

Reproduction is by globular eggs, small and calcareous shelled.

About thirty-seven species are known from tropical Africa. *Curvella* is found also in South Africa, and in the Oriental Region as far as Southern China and the Philippines; but not in Madagascar.

84. **Curvella bathytoma**, new species

Plate XX, Figure 2

Mbisi near Masisi, 1 specimen (Bequaert Coll.).

The shell is broadly ovate-conic, openly umbilicate (the width of the umbilicus contained about five times in that of the shell), fragile, a little yellower than ecru-olive. Summit obtuse. Whorls of the spire very convex, separated by a deep, narrowly channelled suture. The last whorl is obese. Sculpture of low, crowded and equal rib-striæ surmounted by cuticular laminæ, which give a silky sheen to the surface. In front of the aperture the laminæ are worn off; at the shoulder they bend backward, and near the suture they are drawn far back, straightened, crowded, and subparallel. On the face of the last whorl there are about 9 striæ in one millimeter. The aperture is piriform. The outer lip retracts above, as usual in the genus, and close to

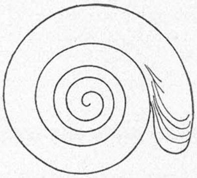

Fig. 58. *Curvella bathytoma*, new species; apical view.

the suture it is drawn back, forming a deep, narrow *Pleurotoma*-like slit (Fig. 58). The columella is subvertical, its edge broadly dilated around the umbilicus.

Length, 7.6 mm.; diameter, 5.5 mm.; length of aperture, 5 mm.; 4½ whorls.

This species, known by a single specimen, has several remarkable features: the large umbilicus, the deep sutural cleft and the cuticular laminæ of the subequal striæ, all arrest attention. The type specimen is broken in the columellar region. This part is restored in the figure, but the exact shape of the columella is not known.

85. **Curvella dautzenbergi,** new species

Plate XX, Figures 1 and 1*a*

Mt. Ruwenzori: western slope, in the Butagu Valley at about 2200 m., type locality. Mukule at 1800-2000 m. (Bequaert Coll.).

The shell is perforate, oval, thin, marguerite yellow, glossy. The spire is very short; summit obtuse. The first 1½ whorls are smooth; next whorl narrower than that immediately preceding, marked with minute, oblique lines. The last whorl is relatively very large, with sculpture of fine, close, unequal and strongly protractive striæ in the upper part; in the median or equatorial part the striæ weaken, become fewer and vertical. On the basal portion they are still weaker. The suture, though narrow, is deeply impressed, giving the spire a terraced appearance. The aperture is piriform, very narrow above, subvertical. The columella is rather thick with a reflected edge; in profile view it is seen to be spirally twisted. The thin outer lip arches forward, the upper part being deeply retracted.

Length, 8.5 mm.; diameter, 5.2 mm.; length of aperture, 6 mm.; 5½ whorls; Butagu Valley.

Length, 9.2 mm.; diameter, 5.5 mm.; Mukule.

The shape is more nearly globular than in any other species known to me. The superior sinuation of the lip is also unusually deep, much as in *Hypolysia* Melvill and Ponsonby,[1] which appears to be merely an elongate, deeply sinused *Curvella.*

86. **Curvella langi,** new species

Plate XX, Figures 3, 4, and 4*a*

Ituri Forest: Penge, type locality, 25 specimens; Avakubi (Bequaert Coll.); and Medje, 1 specimen (Lang and Chapin Coll.). Also Rutshuru, 1 specimen (Bequaert Coll.).

The shell is imperforate, oblong-conic, thin, pale olive-buff, imperfectly transparent, but enough to show the columellar axis through the last whorl. Summit rounded. The first 1⅓ whorls are smooth; the next whorl closely sculptured with vertical striæ. Following whorls of the spire with sculpture of protractive grooves and some finer ripples. On the last whorl, the grooves become weaker in the middle and below, though continuing over the base. The suture has a narrow gray border. The aperture is piriform. The columella has a somewhat thickened, strongly convex edge and a very thin, closely adherent reflected film. The outer lip is rather deeply retracted above, and arches forward in the middle.

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[1] 1901, Ann. Mag. Nat. Hist., (7) VIII, p. 318.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
10 mm.	4.7 mm.	5.2 mm.	6⅓	
11	4.8	6.0	6⅓	Type

This species resembles *C. disparilis* (Smith) in general shape, differing in form of the columella and in being wholly imperforate in the adult, though narrowly perforate in earlier stages of growth. Most of the known Central African species are perforate. There is some variation in the proportions, and in the height of the penult whorl (compare Pl. XX, figs. 3 and 4). The specimens figured are from the type locality, Penge.

87. **Curvella chapini,** new species

Plate XX, Figure 6

Medje, 1 specimen (Lang and Chapin Coll.).

The shell is imperforate, thin, turrited, the spire long; olive-buff. Surface glossy, the initial whorl smooth, pale, the next closely and regularly striate vertically; subsequent whorls of the spire having strongly arched grooves with intervening striæ; the last whorl having the same sculpture above, the striæ somewhat weaker on the lower half. The whorls are strongly convex. Suture simple, impressed. The aperture is piriform. The columella is broadly and deeply concave below, passing into an oblique fold above. The thin reflection is closely adnate. The outer lip arches forward strongly in the upper half.

Length, 13.2 mm.; diameter, 5 mm.; length of aperture, 5 mm.; 7⅓ whorls.

This species appears most like *C. suturalis* (v. Martens), but that differs by the raised girdle below the suture and the umbilicus. The shape of the columella is somewhat unusual.

88. **Curvella thysvillensis,** new species

Plate XX, Figures 5 and 5*a*

Thysville, in a cave, 23 specimens (Lang and Chapin Coll.) and 8 specimens (Bequaert Coll.).

The shell is perforate, straightly conic, marguerite yellow, slightly transparent. The summit, though very small, is rounded; first 1½ whorls smooth, the next whorl vertically strongly, closely and evenly striate; subsequent whorls moderately convex, unevenly striate, the striæ retracted above, and at short intervals there are more deeply impressed grooves among the striæ. On the last whorl the striæ weaken in the middle and are practically effaced in the lower half, but the grooves continue unchanged over the base. The suture is moderately impressed, narrowly gray-bordered below. The aperture is ovate, but slightly oblique. The columella is straight, vertical, its edge reflected, half covering the umbilicus. The outer lip is very little arched forward in the upper part.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
13.5 mm.	6.1 mm.	5.4 mm.	7½
13.2	5.8	5.1	7½

The long, straightly conic spire and small aperture are unlike those of *C. concentrica* (Reeve) and *C. guineensis* (Philippi). I have not seen *C. terrulenta* (Morelet), from the French Congo, which agrees by its straight columella, but it appears from the description to differ by the color and sculpture; the published figure is too small to show anything more than the general shape.

Other Species of *Curvella* Recorded from the Belgian Congo

Curvella delicata (Taylor)

Opeas delicata Taylor, 1878, Quart. Journ. of Conch., I, p. 281, Pl. iii, fig. 3 (type locality: Zanzibar).

Hapalus delicatus Taylor. E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 130, Pl. v, fig. 16.

Curvella delicata Taylor. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 58, Pl. viii, figs. 33-35.

The typical form is known from Zanzibar, Usambara, and Uganda.

Curvella delicata var. *gracilior* (v. Martens)

Hapalus delicatus var. *gracilior* E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 130.

Curvella delicata var. *gracilior* v. Martens. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 58.

Type locality: Ongenya in the forest west of the Semliki River (Stuhlmann Coll.).

Curvella disparilis (Smith)

Bulimus (*Hapalus*) *disparilis* E. A. Smith, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 156, Pl. v, fig. 13 (type locality: Mamboia, 4000-5000 feet).

Hapalus disparilis Smith. E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 128, Pl. i, fig. 12.

Curvella disparilis Smith. Pilsbry, 1906, Man. of Conch., (2) XVIII, p. 54, Pl. viii, figs. 16 and 21.

Semliki Valley: Karevia at 1175 m., Bundeko, and Ongenya; also Migere in Butumbi (Stuhlmann Coll.).

Curvella ovata (Putzeys)

Hapalus ovatus PUTZEYS, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lviii, fig. 10.

Curvella ovata Putzeys. PILSBRY, 1906, Man. of Conch., (2) XVIII, p. 51, Pl. VII, fig. 8.

Type locality: Nsendwe (Dupuis Coll.).

Resembles *Pseudopeas* in form and, as the apical sculpture was not definitely described, the genus is uncertain.

The following species probably occurs also within Belgian territory:

Curvella conoidea (v. Martens) PILSBRY, 1906, Man. of Conch., (2) XVIII, p. 56, Pl. VIII, fig. 18 =*Hapalus conoideus* E. v. MARTENS, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 177; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 129, Pl. V, fig. 14. POLLONERA, 1909, Il Ruwenzori, Parte Scientif., I, p. 204. Migere in Butumbi (type locality); on the eastern slope of Mt. Ruwenzori in the Mobuku Valley, 2000 m.

Clausiliidæ

The two species of Clausiliidæ known from tropical Africa have not yet been studied by any one acquainted with the system of the group. Whether they are related to the *Clausiliæ* of Europe or to the phædusoid series of eastern Asia is still to be ascertained. One of the species may perhaps occur within the limits of the Belgian Congo. They are to be looked for on rocks or tree trunks, where the country rock is limestone, or volcanic rock containing lime.

CLAUSILIA Draparnaud

Clausilia DRAPARNAUD, 1805, Hist. Nat. Moll. terr. fluv. France, pp. 24 and 68.

Clausilia giraudi BOURGUIGNAT, 1885, Notice prodrom. Moll. Giraud Tanganika, p. 22; 1889, Moll. Afr. Equator., p. 117, Pl. V, figs. 8 and 9. E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 131, fig. In the clefts of rocks near Pambete, on the southern shore of Lake Tanganyika. This locality is in North East Rhodesia at the extreme southern end of the lake.

The only other species known from Central Africa is *C. degeneris* PRESTON, 1911, Ann. Mag. Nat. Hist., (8) VII, p. 471, Pl. XI, fig. 23, from near Mt. Kenia. A few species have been described from Abyssinia.

Streptaxidæ

Holopod, jawless rapacious snails with the shell well developed, of somewhat glassy texture; all teeth of the radula of the "aculeate" form; kidney not longer than the pericardium, broader than long. Living animal having yellow or scarlet coloring.

A large family, with numerous genera in Africa and South America; three in the Oriental Region, two of them also African. No holarctic species are known, either recent or fossil. In Africa it probably numbers more species than any other family. There has been mature adaptive radiation, resulting in pupiform, stenogyroid, bulimoid, helicoid, and streptaxid shell forms. They inhabit a variety of stations and the shells range in size from two or three to over forty millimeters.

The subfamilies and genera are based almost wholly upon characters of the shell, as the soft anatomy of very few has been investigated.

Terminology of Apertural Lamellæ and Folds

The teeth of the aperture have been developed in about the same positions as in the Pupillidæ, *Odontostomus*, and some other genera having shells of the same contour, and they may best be described by using the same terminology, so far as applicable. Teeth upon or within the parietal and columellar borders are termed lamellæ, those within the outer and basal margins are folds or plicæ, as in the above diagram (Fig. 59).

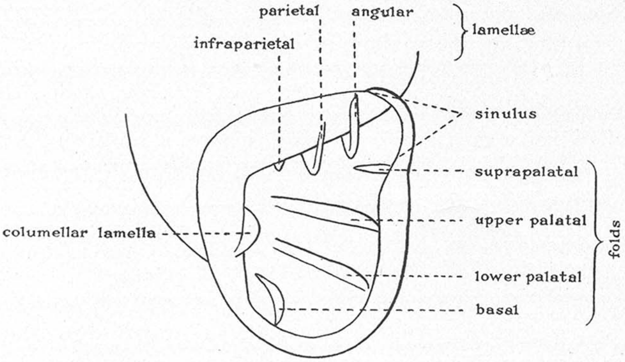

Fig. 59. Aperture of a *Ptychotrema* (diagrammatic) to illustrate terminology used.

In *Gulella* the palatal folds are usually not distinctly differentiated or their positions definitely fixed, and they are usually spoken of simply as palatal folds, without distinction as to upper or lower.

Streptaxinæ

In the last general classification of Streptaxidæ, that of Kobelt and von Mœllendorff, a division into two subfamilies is based upon the shell contour. In the Streptaxinæ the spiral is helicoid or planorboid, in the Enneinæ it is lengthened axially. Though this character is not in itself of much significance, it would serve, while most genera are still little known anatomically, were it not that *Edentulina* with its satellite or closely allied groups effects a compromise. Although *Edentulina* has generally been treated as a subgenus of *Ennea,* it is, in fact, merely a lengthened *Eustreptaxis. Marconia* may be regarded as a nearly symmetrical *Gonaxis,* yet it has the shape of "*Ennea.*" Kobelt recognized this difficulty, in treating of *Edentulina.* The series *Edentulina, Marconia, Eustreptaxis, Gonaxis, Gibbonsia, Colpanostoma,* etc. cannot logically be distributed into two subfamilies; all, whether lengthened, helicoid or planorboid, belong in the Streptaxinæ.

This much will probably be obvious to anyone who has a good series of species belonging to these groups and will go over them uninfluenced by generic labels. The division into genera is a far more recondite matter. We have had no comparative anatomical study of Streptaxinæ, and the shell characters are not so definite that we can expect agreement among malacologists.

It appears to me unlikely that the South American *Streptaxis* is generically identical with the African *Eustreptaxis,* though the similarity of the shells is very great and there is at least a general similarity in the soft anatomy. As a temporary expedient, I am considering them distinct genera, in advance of the evidence.

In *Edentulina, Eustreptaxis, Marconia,* and *Gonaxis,* the shell forms are so closely connected that, while there is no difficulty in assorting the species and the extreme forms of each are conspicuously unlike, it is not easy to see where generic lines are to be drawn. For the purposes of this list the conspicuously distorted forms are placed in *Gonaxis; Edentulina* and *Marconia* are left as genera. This is merely a working arrangement, as the materials for an opinion of any value will not exist until a comparative study of the soft anatomy can be made.

The umbilicate, regular, helicoid Streptaxinæ appear to form several genera, but none have been reported from the Belgian Congo. Several species referred to *Rhytida* by Thiele (1911) belong here. They are surely not Rhytididæ, the texture and the finish of the peristome are streptaxid characters.

Genera and Subgenera of Congo Streptaxinæ

1. Distortion very inconspicuous, but the front of the last whorl is perceptibly flattened. Length much greater than the diameter......................3.

Distortion conspicuous, the last whorl obliquely flattened on the left side of the front. Diameter usually exceeding the altitude. *Gonaxis* Taylor..........2.

2. Small species, the last whorl much distorted................*Gonaxis*, proper.
Type: *Ennea gibbonsi* Taylor.
Rather large, globosely conoid shells........Subgenus *Eustreptaxis* Pfeiffer.
Type: *Ennea nobilis* Gray.

3. Spire somewhat conic or convexly conic..................*Edentulina* Pfeiffer.
Type: *Bulimus ovoideus* Bruguière.
Shell shortly cylindric, with very obtuse, dome-like summit.
Marconia Bourguignat.
Type: *Marconia gibbosa* Bourguignat.

EDENTULINA Pfeiffer

Edentulina Pfeiffer, 1855, Malak. Blätter, II, p. 173.

89. **Edentulina langiana,** new species

Stanleyville, 1 specimen (Lang and Chapin Coll.).

The shell (Fig. 60) is large, shortly rimate, thin, whitish (but formerly covered with a thin yellowish cuticle of which remnants remain in the umbilical region and on the parietal wall); very finely and lightly striate, the striæ irregular or vermiculate in places, especially on the back of the last whorl. The summit is obtuse, rounded; the whorls are moderately convex, the last somewhat flattened in front, the base strongly convex, sac-like. The suture ascends in its last fourth of a turn. The aperture is vertical. Outer lip thin, narrowly reflected. The columella is straight, vertical from in front, but entering obliquely in an oblique view in the mouth. Its edge is dilated above the umbilical crevice which is deep and straight.

Length, 39.5 mm.; diameter, 20.7 mm.; length of aperture, 18.5 mm.; 6¾ whorls.

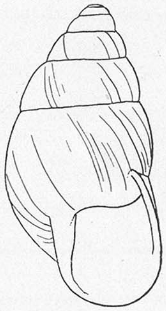

Fig. 60. *Edentulina langiana*, new species.

This is one of the largest species. It resembles *E. ovoidea* (Bruguière), but differs by the thinner shell, the saccate base (*E. ovoidea* having a tapering base), by the longer ascent of the suture to the aperture, and finally by the narrower lip. *E. insignis* (Pfeiffer)[1] has a much broader spire and more transverse umbilical crevice, but it is doubtless the most closely related species. *E. martensi* (Smith)[2] differs in sculpture.

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[1] 1855, Proc. Zool. Soc. London, p. 100. Gaboon. I have compared a specimen from Buea, Kamerun.
[2] 1882, Journ. of Conch., III, p. 301; West Africa.

Edentulina ovoidea (Bruguière) Bourguignat, 1889, Moll. Afr. Equator., p. 140 (=*Bulimus ovoideus* Bruguière, 1789, Encycl. Méthod. Vers, I, p. 335. *Ennea ovoidea* E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 11, Pl. ii, figs. 11-13. Germain, 1916, Bull. Mus. Hist. Nat. Paris, p. 244) is recorded from Madagascar, the Comoro Islands and East Africa, especially from the regions between the Indian Ocean and Lake Tanganyika. Dupuis and Putzeys, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. lix, record this species from Nsendwe (Dupuis Coll.); it seems possible that their specimens were not the true East African *ovoidea*, but belonged to the species here described as *E. langiana* [J. B.].

MARCONIA Bourguignat

Marconia Bourguignat, 1889, Moll. Afr. Equator., p. 135.

Type: *Marconia gibbosa* Bourguignat, 1889.

The shell is longer than wide, shortly rimate, in form shortly cylindric with rounded ends, oblong or oval, very little distorted, but a slight flattening of the ventral face of the last whorl is usually discernible.

The species, from their simplicity of form, are difficult to distinguish. Part of them were originally described as *Ennea*, part as *Streptaxis;* but the group is distinct enough, and by the shell characters stands between the typical *Edentulinæ* and *Gonaxis*.

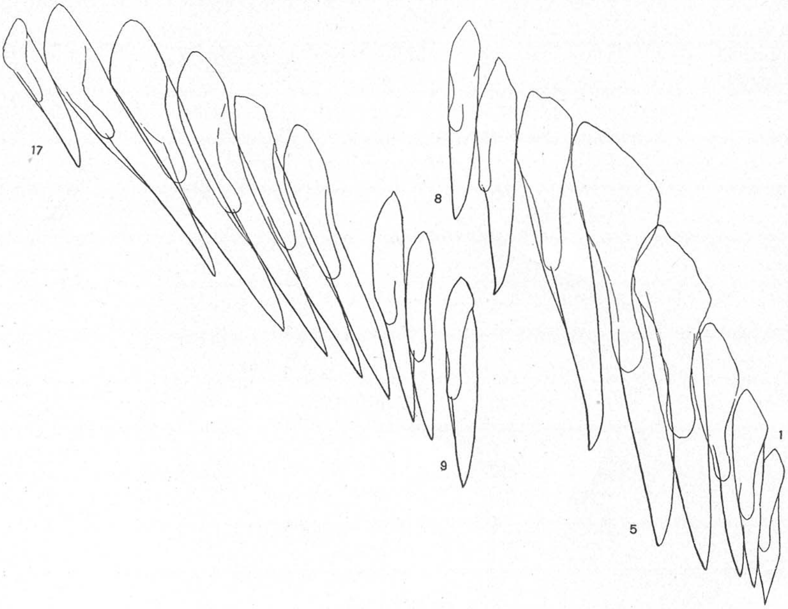

Fig. 61. Half row of teeth of *Marconia lata ruwenzoriensis*, new subspecies.

The radula of *Marconia lata* (Fig. 61) is peculiar. There is no central tooth. The laterals increase from the first to the fifth, which is very large. They decrease thence to the eighth; this and the next two teeth being about equal to the second. Another increase culminates in the fifteenth tooth which is about as long as the fourth. The sixteenth and especially the seventeenth (last) diminish rapidly. The inner large laterals have broad basal plates. The outer laterals are more aculeate, with narrower basal plates. The teeth of *Marconia latula* (v. Martens), as figured by Thiele, are similar except that the seventh lateral tooth is not much more than half as long as the sixth, and there are twenty teeth on a side.

By having two zones of large teeth separated by a zone of smaller ones, on each side of the unarmed rachis, *Marconia* differs from *Eustreptaxis* and most other genera, in which, after a maximum is attained, there is a gradual decrease. It is this peculiar specialization of the radula which influences me to allow *Marconia* generic rank.

90. **Marconia kivuensis** (Preston)

Ennea kivuensis PRESTON, 1913, Proc. Zool. Soc. London, p. 197, Pl. XXXIV, fig. 3. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 10.

Near Lake Kivu (type locality; Kemp Coll.). Vieux Kassongo and Lukonzolwa (Bequaert Coll.).

Mukule, at 1800-2000 m., 10 specimens; Luvunu near Masisi, at 1800 m., 5 specimens (Bequaert Coll.).

The shell is cylindric-oblong, the spire rounded, dome-shaped, the first two whorls are smooth, the next two with sculpture of close, arcuate, oblique striæ. On the first penult whorl the striæ weaken below and scarcely reach down to the suture; and the last whorl has extremely weak striation except behind the aperture and close to the suture where is found a very narrow band of strong, fine crenulation, the slightly flattened ventral face being smooth. The intervals between the striæ on the last whorl are closely wrinkled across, giving the appearance of spiral scratches alluded to by Preston. This is most conspicuous on the last half whorl. The suture ascends shortly close to its termination. The peristome is somewhat thickened within, very narrowly reflected. The umbilical crevice is short, nearly straight.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
10.2 mm.	5.8 mm.	4.8 mm.	5¾
10.5	6.3		6

It is distinguished from the related species by the sharp sculpture of the upper whorls. *M. gaudioni* (Putzeys), of about the same size, has sculpture like *M. translucida*, according to the published account. *Ennea* (*Edentulina*) *latula* v. Martens should also be compared as to details of sculpture. It is somewhat larger, 13 to 15 mm. long.

Marconia lata (E. A. Smith)

Ennea lata E. A. Smith, 1880, Proc. Zool. Soc. London, p. 347, Pl. xxxi, fig. 4 (type locality: Ujiji on the east shore of Lake Tanganyika).

Gibbus latus Smith. Tryon, 1885, Man. of Conch., (2) I, p. 84, Pl. xvii, figs. 34 and 35.

Marconia lata Smith. Bourguignat, 1889, Moll. Afr. Equator., p. 136.

Regions east of Lake Tanganyika in German East Africa. The typical form is not known from the Belgian Congo.

91. **Marconia lata ruwenzoriensis**, new subspecies

Mt. Ruwenzori: on the western slope in the Lamia Valley at about 2000 m., type locality; also in the Butagu Valley at 1800 and 2200 m. Walikale; and Mbisi near Masisi (Bequaert Coll.).

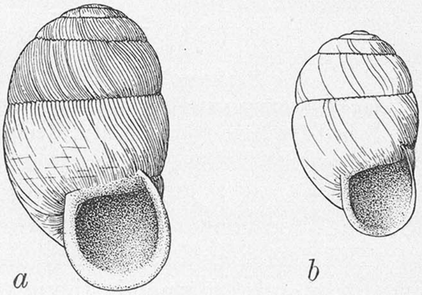

Fig. 62. *a*, *Marconia lata ruwenzoriensis*, new subspecies; *b*, *Marconia gibbosa humilior*, new subspecies.

The shell (Fig. 62*a*) agrees well with *M. lata* (Smith) from Ujiji, except by its smaller size in the series of sixteen examined from Mt. Ruwenzori. Single specimens from the other localities are still smaller. The surface is finely striate obliquely except on the slightly flattened ventral face of the last whorl, which is nearly smooth. The subsutural crenulation is well developed.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
13.5 mm.	8.0 mm.	6.1 mm.	6½	Mt. Ruwenzori (Lamia), 2000 m.
13.9	8.3	6.2	6½	Type; same locality
15.0	8.3	6.6	6½	Same locality
15.5	9.0	6.6	6½	Mt. Ruwenzori (Butagu), 1800 m.
11.8	6.8	5.6	6⅓	Walikale
11.2	7.0	5.2	6	Mbisi, near Masisi

In *M. translucida* (Putzeys) the penult whorl bulges more on the left side, and the aperture is smaller.

Marconia gibbosa Bourguignat

Marconia gibbosa Bourguignat, 1889, Moll. Afr. Equator., p. 137, Pl. vii, figs. 6 and 7.

Described from German East Africa: Usagara (between Kondoa and Mpwapwa); and Ugogo (between Dyaza and Ibohi). The typical form has not been found in the Belgian Congo.

92. **Marconia gibbosa humilior,** new subspecies

On the Aruwimi River between Panga and Bomili, in the forest, 1 specimen (Bequaert Coll.).

The shell (Fig. 62*b*) is smaller than *Marconia gibbosa* Bourguignat; the surface is smooth except for short, fine crenulation below the suture on the last four whorls, and numerous, irregularly spaced impressed lines, marking places of growth-arrest, and preceded by light yellowish-olive lines; the shell itself being slightly greenish buff, somewhat transparent and very thin. The penult whorl bulges at the left side, and the last whorl is somewhat flattened in front. The suture ascends rather decidedly to the aperture. Outer lip sinuous, thin, very narrowly reflected. The umbilical crevice is short and a little sinuous.

Length, 10 mm.; diameter, 6.2 mm.; length of aperture, 4.8 mm.; nearly 6 whorls.

Other Species of *Marconia* Recorded from the Belgian Congo

Marconia gaudioni (Dupuis and Putzeys)

Streptaxis gaudioni Dupuis and Putzeys, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. lii, fig. 22.

Type locality: Nsendwe (Dupuis Coll.).

According to Germain, 1911, Bull. Mus. Hist. Nat. Paris, p. 231, this is a synonym of *Marconia vitrea* (Morelet).

Marconia latula (v. Martens)

Ennea latula E. v. Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 175.

Ennea (*Edentulina*) *recta* var. *latula* E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 14, Pl. ii, fig. 8.

Edentulina latula v. Martens. J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 183, fig. vii; Pl. vi, fig. 55.

Migere in Butumbi (type locality; Stuhlmann Coll.); Mt. Ninagongo, 2500-3000 m. (Schubotz Coll.). At 90 km. west of the south shore of Lake Albert Edward, 1600 m. (Grauer Coll.).

Marconia translucida (Dupuis and Putzeys)

Streptaxis translucidus Dupuis and Putzeys, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. li, fig. 21.

Type locality: Nsendwe, in the forest (Dupuis Coll.).

According to Germain, 1911, Bull. Mus. Hist. Nat. Paris, p. 231, this is perhaps only a var. *major* of *Marconia vitrea* (Morelet).[1]

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[1] *Ennea vitrea* Morelet, 1868, Voy. Welwitsch, Moll. terr. et fluviat., p. 84, Pl. ii, fig. 3 (type locality: Mt. Cungulangulo in the district Golungo Alto, Angola). *Gibbus vitreus* Tryon, 1885, Man. of Conch., (2) I, p. 84, Pl. xvii, fig. 33. *Marconia vitrea* Bourguignat, 1889, Moll. Afr. Equator., p. 136. *Streptaxis vitrea* Germain, 1911, Bull. Mus. Hist. Nat. Paris, p. 230 (Querké on the French border of Liberia).

The following two species will probably be found also in the Belgian Congo.

Marconia gravieri (Germain) = *Ennea gravieri* Germain, 1907, Bull. Mus. Hist. Nat. Paris, p. 65; 1908, in A. Chevalier, L'Afr. Centr. Française, p. 477, Pl. v, fig. 1. Type locality: Krebedje (Fort Sibut).

Marconia margarita (Preston) = *Ennea margarita* Preston, 1913, Proc. Zool. Soc. London, p. 196, Pl. xxxiv, fig. 8. Type locality: Kigezi, extreme S. W. Uganda, 6000 feet.

Gonaxis Taylor

Gonaxis Taylor, 1877, Quart. Journ. of Conch., I, p. 252. Monotype: *Gonaxis gibbonsi* Taylor.

Lamelliger Ancey, 1882, Le Naturaliste, p. 399. Monotype: *Streptaxis troberti* Petit.

Subgenus **Gonaxis**, proper

93. **Gonaxis cavallii** (Pollonera)

Streptaxis cavallii Pollonera, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 538, p. 2 (type locality: eastern slope of Mt. Ruwenzori, in the Mobuku Valley, at about 2000 m.); 1909, Il Ruwenzori, Parte Scientif., I, p. 183, Pl. xx, fig. 1.

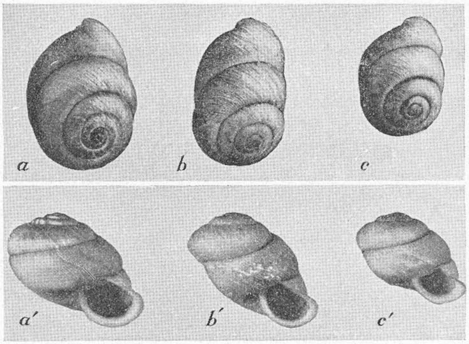

Fig. 63. *a* and *a′*, *Gonaxis nseudweensis* (Putzeys); *b* and *b′*, *Gonaxis cavallii* (Pollonera); *c* and *c′*, *Gonaxis cavallii ituriensis*, new subspecies; all twice natural size. The upper views represent the shells lying on a horizontal surface.

Mt. Ruwenzori: in the valley of the Butagu River on the western slope at about 1800 and 2200 m., 10 specimens. A common species in the lower mountain forest, under decayed leaves and in superficial soil (Bequaert Coll.).

The specimens (Fig. 63*b* and *b′*) agree well with Pollonera's description and figure except that the penult whorl projects a little more on the left outline.

Greatest length, 10.8 mm.; dorso-ventral diameter measured at a right angle with length, 5.5 mm.; greatest diameter, 6.8 mm.

A smaller example measures: 9.8, 5.2, and 6.4 mm.

A topotype of *G. nseudweensis* measures: 11.1, 5.8, and 8 mm. The greatest diameter is thus over two-thirds of the length, while in *G. cavallii* it is less than two-thirds. *G. nseudweensis* is a more compact shell.

94. **Gonaxis cavallii ituriensis,** new subspecies

Ituri Forest: Penge, type locality, and Avakubi. Semliki Forest: Lesse. Rutshuru in the forest gallery of the Rutshuru River. Numerous specimens (Bequaert Coll.).

The shell (Fig. 63*c* and *c'*) is smaller than *G. cavallii*, less oblique, and, as the form is more compact, the diameter is somewhat greater relative to the length. There are 5½ whorls, all but the initial half whorl being regularly rib-striate.

Length	*Smaller Diameter*	*Greatest Diameter*
9.4 mm.	5.1 mm.	6.5 mm.
8.7	5.0	6.1

While very close to *G. cavallii*, this appears to be a distinguishable race on comparison of considerable series of both forms. Both are quite distinct from *G. nseudweensis* (Putzeys) which is figured for comparison (Fig. 63*a* and *a'*). *G. pusillus* (v. Martens), from the same region, is a smaller shell, of much less oblique shape, according to v. Martens' figures.

Subgenus **Eustreptaxis** Pfeiffer

Eustreptaxis Pfeiffer,[1] 1878, Nomencl. Helic. Vivent., p. 15. *Streptaxis nobilis* Gray here selected as type.

95. **Gonaxis (Eustreptaxis) micans** (Putzeys)

Streptaxis micans Putzeys, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lv, fig. 2. Dupuis and Putzeys, 1901, *op. cit.*, XXXVI, p. xli, fig. 14 (living animal). J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 184, Pl. iv, fig. 24. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 3.

Forest of the Warega in the Manyema district (type locality; Dupuis Coll.). Basoko, Vieux Kassongo (Bequaert Coll.).

Stanleyville, 14 specimens (Lang and Chapin Coll.). Avakubi, Mbisi and Luvunu (near Masisi), Walikale, Lubutu (Bequaert Coll.).

This species (Fig. 64*a* and *b*) has been well described by Putzeys. Many of the specimens have the penult whorl a little higher than his figure shows. Two from Stanleyville measure:

Greatest Length	*Diameter, at Right Angles with Longest Axis*	*Number of Whorls*
22.0 mm.	14.0 mm.	7
19.6	13.5	6½

The ventral flattening is quite conspicuous, and there is a prominent swelling of the penult whorl at the point of insertion of the outer lip.

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[1] *Eustreptaxis* was mentioned by Pfeiffer, but without definition or species, in 1877, Malak. Blätter, XXIV, p. 5.

This gives a strongly reversed S curve to the upper margin of the aperture. The umbilical suture is short, about 4 mm. long measured to the insertion of the columellar lip, and it runs straight back, in a basal view being about parallel to the outer lip. Occasional individuals show a narrow buttonhole-shaped perforation at the termination of this rima. The aperture is strongly oblique.

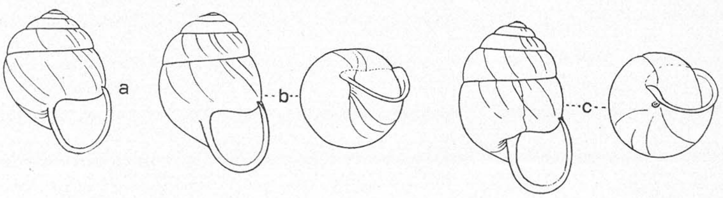

Fig. 64. *Gonaxis micans* (Putzeys): *a* and *b*, typical form; *c*, mutation *apertus.*

The single example from Walikale is larger than any known from elsewhere, its greatest measurement being 25 mm.

In two examples from Stanleyville found with the typical *G. micans*, the umbilicus is entirely open and deep, though small. The face of the last whorl is more convex than in true *micans*. As the other characters are the same, I suspect that this form may be an extreme aspect of variation; yet, as the difference is rather conspicuous and there are no transitional specimens, this form may be known as **G. micans** mut. **apertus** (Fig. 64*c*).

96. **Gonaxis (Eustreptaxis) vulcani** (J. Thiele)

Streptaxis vulcani J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 184, fig. viii (teeth); Pl. iv, figs. 22 and 23.

Mt. Ninagongo at 2500-3000 m. (type locality; Schubotz Coll.). Also from the Rugege Forest at 2100 m. (Grauer Coll.).

Mukule at 1800-2000 m., 5 specimens; Luvunu near Masisi, 6 specimens (Bequaert Coll.).

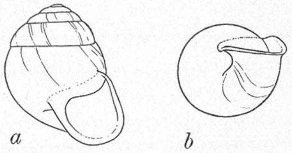

Fig. 65. *a* and *b*, *Gonaxis vulcani* (Thiele).

The shell (Fig. 65*a* and *b*) is rimate, subglobose with very slightly oblique last whorl; translucent gray, becoming opaque gray-white on the last part of the last whorl; glossy. The first 2½ whorls have short delicate, protractive riblets below the suture and are elsewhere smooth. Following whorls have minute, close, regular, oblique rib striæ up to the last whorl, wher the striæ become almost effaced. The spire is hemispherical. The penult whorl is swollen below, under the insertion of the outer lip, and the last whorl, while almost regular, is very slightly flattened on the ventral side. The suture ascends a little close to its termination. The axial suture is rather long, hook-shaped, and runs towards the left. The aperture is vertical, the outer-basal part produced obliquely. The lip is slightly expanded above, becoming reflected near the base and on the columellar margin, and at the two ends it is very slightly retracted to the insertions.

Longest measurement, 19 mm.; diameter at right angles to that, 13 mm.; 6½ whorls.

This species is closely related to *G. micans*, agreeing with that in sculpture and the closed umbilicus. It differs by the more dome-like spire, the less flattened last whorl, and especially by having the aperture vertical, and by the umbilical suture, which runs directly away from the columellar lip, at a right angle with it; in shape resembling a question-mark without the dot (?).

In one individual from Mukule there is a narrowly oblong open umbilical cavity. This may possibly be a distinct species, but as it is identical with *vulcani* in all other characters, I believe it to be a mutation of that species.

The description of *Ennea buccina* Preston agrees well with these examples, but a difference is shown in the figure, which has the parietal margin of the aperture nearly straight and rather steeply sloping, while in all of Bequaert's shells it is strongly reversed S-shaped, the base of the penult whorl being conspicuously swollen below the posterior angle of the aperture.

The spire tapers a little less in these specimens than in Thiele's drawing.

Other Species of *Gonaxis* Recorded from the Belgian Congo

Gonaxis (*Gonaxis*) *nseudweensis* (Putzeys)

Streptaxis nseudweensis Putzeys, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lv, fig. 3.

Streptaxis nsendweensis Dupuis and Putzeys, 1900, p. xix of their reprint from Bull. Séances Soc. Malacol. Belgique; this correction has not been published in the periodical itself.

Type locality: Nsendwe (Dupuis Coll.).

A topotype of *G. nseudweensis* has been figured (Fig. 63*a* and *a'*) for comparison with *G. cavallii*. Two immature specimens in the *Gonyodiscus*-like stage, from Bogoro (Bequaert Coll.), resemble this species closely, and are either *nseudweensis* or a nearly allied form.

Gonaxis (*Gonaxis*) *pusillus* (v. Martens)

Streptaxis pusillus E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 32, Pl. II, fig. 31.

Type locality: "Bukendo am Ituri Fluss" (Stuhlmann Coll.). I believe that by this is meant Bukende in the Semliki Valley, "Ituri" being then a misspelling for "Itiri." No locality "Bukendo" is mentioned near the Ituri River by Stuhlmann in the report of his journey. If my supposition be true, *G. pusillus* was found very close to Lesse, where I collected numerous *G. cavallii ituriensis* and it becomes a question whether the latter form is not after all a synonym of *G. pusillus* [J. B.].

Gonaxis (*Eustreptaxis*) *buccina* (Preston)

Ennea buccina PRESTON, 1913, Proc. Zool. Soc. London, p. 196, Pl. XXXII, fig. 11.

Type locality: Burunga at the foot of Mt. Mikeno, 6000 feet (Kemp Coll.).

This is perhaps the same as *G. vulcani* (Thiele).

Ptychotrematinæ

Enneidæ and Enneinæ, in part, of authors.

Pupiform or stenogyroid Streptaxidæ in which the diameter is less than half the length, or if more, the aperture is conspicuously toothed.

The subfamily Enneinæ of Kobelt and others included also *Edentulina* and *Marconia*, which belong in Streptaxinæ. Some authors have a family Enneidæ, but do not attempt to define it. The status of the group will depend upon the soft anatomy, the characters given above being rather trivial.

Key to the Congo Genera of Ptychotrematinæ

1. Shell like *Subulina* or *Opeas* in contour, tapering upward from the last whorl; aperture toothless, or there may be minute teeth on parietal wall and outer lip..2.
Shell cylindric, oval or tapering, of short whorls, pupiform rather than stenogyroid..3.
2. Outer lip thin and sharp, unexpanded.................*Varicostele*, new genus.
Outer lip smoothly finished or expanded in the adult stage..*Streptostele* Dohrn.
3. Aperture having strong teeth, one or more in the palate entering deeply; back of the last whorl having one or two long spiral furrows...*Ptychotrema* Mörch.
Aperture usually toothed, often pitted behind the peristome, but without deeply entering palatal folds; no spiral furrows on the back.....*Gulella* Pfeiffer.

STREPTOSTELE Dohrn

Streptostele DOHRN, 1866, Malak. Blätter, XIII, p. 128. TRYON, 1885, Man. of Conch., (2) I, pp. 61 and 108. KOBELT, 1904, Syst. Conch. Cab., Enneidæ, p. 337 (monograph).

Raffraya BOURGUIGNAT, 1883, Ann. Sci. Nat. Zool., (6) XV, p. 66.

Tomostele ANCEY, 1885, Bull. Soc. Malacol. France, II, p. 143, for *Achatina muscola* (= *musœcola* Morelet).

Campylaxis ANCEY, 1888, Bull. Soc. Malacol. France, V, p. 68, for *Bulimus folini* Morelet.

Pseudelma KOBELT, 1904, Syst. Conch. Cab., Enneidæ, p. 125. ***Ennea incisa*** Morelet here selected as type.

Ischnostele C. BŒTTGER, 1915, Zool. Jahrb., Abth. für Syst., XXXVIII, p. 373. Type: *I. leroii* C. Bœttger, 1915.

Eustreptostele GERMAIN, 1915, Bull. Mus. Hist. Nat. Paris, p. 285, for *Streptostele truncata* Germain, 1915

Slender, regularly coiled, *Stenogyra*-like Streptaxidæ, tapering regularly from the last whorl, having the outer lip smoothly finished, blunt-edged or thickened, frequently expanded, arching forward somewhat; the aperture toothless or with very small teeth; columella toothless, its edge dilated.

A genus of tropical Africa and the adjacent islands, east and west; not known from Madagascar.

The type is *Bulimus fastigiatus* Morelet.[1]

The Arabian group *Obeliscella*[2] is probably a subgenus of *Streptostele*. The peristome is unexpanded, but it has a smooth finish. As yet its dentition is unknown. *Varicostele*, similar to *Streptostele* in dentition, differs by the acute, unfinished lip of the shell— a character so unusual in the Streptaxidæ that I have thought the group worthy of generic distinction. It is like the immature stages of *Streptostele*.

There has been a persistent confusion of *Streptostele* with the Formosan and Indo-Chinese *Elma*, initiated in the works of H. Adams, followed by Pfeiffer, Tryon, Kobelt, and others. *Elma* has a perforate columellar axis and a broad summit. The immature stages of the shell are quite diverse. The superficial resemblance in the adult stage appears to be a case of convergence in apertural characters, not indicative of any direct relationship.

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[1] This type was designated by E. A. Smith, 1890, Ann. Mag. Nat. Hist. (6) VI, p. 96. Dohrn did not name a type, but he gave an excellent diagnosis and list of species, with descriptions of several. Unfortunately, he included *Bulimus lotophagus* Morelet, in order to complete his list of the land shells of Prince's Island, but stated that he had not seen that species, and that he thought it had been described from a young specimen. It may be added that it does not agree with Dohrn's generic diagnosis. It has been made the type of the genus *Bocageia* Girard, 1893, in the Achatinidæ.

C. F. Ancey, in 1888, proposed to take *Bulimus lotophagus* as type of *Streptostele*, and for the group as defined by Dohrn he offered the new name *Campylaxis*, with *Bulimus folini* Morelet as type. This was one of Dohrn's original species of *Streptostele*.

If Ancey's selection of type be considered valid, *Streptostele* Dohrn will replace *Bocageia* Girard. *Raffraya* Bourguignat will be used for what has always been called *Streptostele*, with *Campylaxis* as a subgenus including what have been regarded as the typical *Streptostele*—nearly all of the known species.

I am not accepting Ancey's name-juggling, because it appears to me that he erred in selecting as type of Dohrn's group a species which that author expressly states that he had not seen, and which disagrees in conspicuous and essential characters with Dohrn's diagnosis. It was really a *species inquirenda* from his standpoint, and as such was not available as a type, under existing rules. This is a case which should be decided by the International Commission on Zoological Nomenclature.

[2] *Obeliscella* JOUSSEAUME, 1889, Bull. Soc. Malacol. France, VI, p. 359. PILSBRY, 1906, Man. of Conch., (2) XVIII, p. 100.

The number of species of *Streptostele* is somewhat uncertain, as part of the East and Central African shells described as *Opeas* doubtless belong to the present genus. Thiele has found that *Opeas crenulatum* Smith has the teeth of *Streptostele* and he believes that *O. limpidum* v. Martens also belongs there. *Opeas lenta* Smith and *O. varicosum* d'Ailly[1] appear to me, from the descriptions, to be *Streptostele;* doubtless others may be detected when the African species described as *Opeas* are all re-examined with this in view. The smooth-edged lip of *Streptostele* is assumed only in the adult stage, or at resting periods, when these are indicated; at other times the lip is acute, as in *Opeas*.

List of Described Species of *Streptostele*

PRINCE'S ISLAND

Streptostele fastigiata (Morelet)
" " *minor* Tryon.
" *folini* (Morelet).
" (*Tomostele*) *feai* Germain.
" " *moreletiana* Dohrn.

FERNANDO PO

Streptostele (*Tomostele*) *truncata* Germain.

CONTINENTAL AFRICA

Streptostele alluaudi Dautzenberg and Germain.
" *bacillum*, new species.
" *bequaerti*, new species.
" *buchholzi* v. Martens. Kamerun.
" *centralis*, new species.
" " *coloba*, new subspecies.
" *costulata* v. Martens.
" " *minor* v. Martens.
" *crenulata* E. A. Smith.
" *dautzenbergi*, new species.
" *exasperata* Preston. Mt. Kenia.
" *langi*, new species.
" *leopoldvillensis*, new species.
" *limpida* (v. Martens).

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[1] 1910, Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro Sjöstedt, I, part 6, p. 27.

Streptostele media O. Bœttger. Kamerun.
" *polymorpha* Preston. Mt. Kenia.
" *pusilla* d'Ailly. Kamerun.
" *simplex* E. A. Smith.
" *streptosteloides* (v. Martens).
" *subangusta* v. Martens. Kamerun.
" *zambiensis*, new species.
" (*Raffraya*) *herma* Connolly. Rhodesia.
" " *horei* E. A. Smith.
" " *leroii* (C. Bœttger). Bahr el Abiad, Sudan.
" " *milne-edwardsi* (Bourguignat). Abyssinia.
" (*Tomostele*) *congoris*, new species.
" " *elegans* Dautzenberg and Germain.
" " *musæcola* (Morelet).
" (*Graptostele*) *teres*, new species.

COMORO ISLANDS: MAYOTTE

Streptostele (*Pseudelma*) *auriculata* (Morelet).
" " *incisa* (Morelet).
" " *martensiana* (Morelet).

SEYCHELLES

Streptostele (*Stereostele*, new subgenus) *nevilli* (H. Adams).

Key to Subgenera and Species of *Streptostele* from the Belgian Congo

1. Shell without longitudinal (axial) sculpture, the embryonic whorls spirally engraved; imperforate; the outer lip unexpanded, arching forward; columella slightly twisted, weakly excised at the base; length: 4.5 mm. Subgenus *Graptostele*..........*S. teres*, new species.
   Embryonic whorls smooth, the rest of the shell having longitudinal ribs or striæ at least below the suture..........2.
2. Columella *Subulina*-like, distinctly truncated at the base. Subgenus *Tomostele*..........3.
   Columella not truncate, curving into the basal margin..........5.
3. Length: 11 mm..........*S. elegans* Dautzenberg and Germain.
   Length: about 5.5 mm..........4.
4. Composed of 7 whorls..........*S. musæcola* (Morelet).
   Composed of 8 whorls; more slender..........*S. congoris*, new species.
5. Outer lip obtusely toothed or thickened within, above the middle; a small angular tubercle. Subgenus *Raffraya*.......... *S. horei* Smith.
   Aperture without teeth. *Streptostele*, proper..........6.
6. Diameter contained about four times in the length; imperforate..........7.
   Diameter contained about three to three and a half times in the length..........8.

7. Smooth except below the suture; 11.7 × 2.7 mm.; of 10½ whorls.
S. zambiensis, new species.
With very close, very weak riblets; 11 × 2.6 mm.; of 8 whorls.
S. alluaudi Dautzenberg and Germain.
Costulate; 8.4 × 2.1 mm.; of 9 whorls.........*S. dautzenbergi*, new species.

8. Imperforate...9.
Perforate or rimate.......................................11.

9. Close rib-striæ, spiral wrinkles in the intervals; shell strongly tapering; 14.8 × 4.4 mm.; of 9½ whorls..........................*S. langi*, new species.
Striate, but without spiral wrinkles.................................10.

10. Weakly, closely striate, of glassy clearness; 11 × 13 mm.; of 9 to 9½ whorls.
S. limpida (v. Martens).
Coarse, weak striæ, shell tapering but little; 3.75 × 1.5 mm.; of 7 whorls.
S. bacillum, new species.

11. Closely rib-striate; summit very obtuse; 9 × 3 mm.; of 6½ whorls.
S. streptosteloides (v. Martens).
Closely rib-striate; 12.5 × 4 mm.; of 9 whorls.........*S. costulata* v. Martens.
Fine, regular striation; 12.4 × 4.2 to 13 × 4 mm.; of 9 whorls.
S. bequaerti, new species.
Narrow, rather spaced striæ; 11 × 3.7 mm.....*S. leopoldvillensis*, new species.
Very weak striæ, stronger below the sutures.........................12.

12. 11.5 × 3.4 mm.................................*S. centralis*, new species.
9 × 2.7 mm...........................*S. centralis coloba*, new subspecies.

Subgenus **Streptostele**, proper

97. **Streptostele zambiensis**, new species

Plate XXI, Figure 1

Zambi, numerous specimens (Lang and Chapin Coll.).

The shell is imperforate, slender, turrited, the diameter contained about four times in the length; translucent whitish, or having a very faint buff tinge; very glossy. The summit is obtuse, rounded, the first whorl rapidly increasing, the next two of about equal diameter (about 0.75 mm. at the second whorl); the embryonic shell of three whorls, being therefore subcylindric, with convex whorls and a simple suture. The following whorls increase regularly, are moderately convex, and almost smooth except below the suture, where there is a minutely but strongly costulate border. The suture is moderately impressed, and after the embryonic stage, is crenulated. The aperture is oblique. Columella vertical, nearly or quite straight, rounded. The outer lip is smooth, very little thickened, with an extremely narrow expansion; in the upper part it arches forward somewhat.

Length, 11.7 mm.; diameter, 2.7 mm.; length of aperture, 2.5 mm.; 10½ whorls.

This is a decidedly narrower shell than *S. buchholzi* v. Martens, with a smoother surface and more strongly crenulate suture.

98. **Streptostele leopoldvillensis,** new species

Plate XXI, Figure 2

Leopoldville, 4 specimens (Bequaert Coll.).

The shell is shortly rimate and in shape resembles *S. costulata* v. Martens, as figured by Thiele, being more conic than *S. centralis*. On the spire there are narrow, rather widely spaced striæ, the last whorl having them closer, but weakening downwards, not extending upon the base, and above they crenulate the suture distinctly. The columella is straight, oblique, its edge triangularly dilated.

Length, 11 mm.; diameter, 3.7 mm.; length of aperture, 3.2 mm.; 8½ whorls.

This may be a subspecies of *S. costulata* v. Martens; yet, as the localities are remote, I allow it specific standing. *S. alluaudi* Dautzenberg and Germain is a decidedly narrower shell, the diameter being given as 2.6 mm. in a shell 11 mm. long. This difference is conspicuous on comparison of a paratype of *alluaudi*. The latter is of smaller caliber throughout, the summit also being smaller than in *leopoldvillensis*.

99. **Streptostele langi,** new species

Plate XXI, Figure 3

Ituri Forest: Medje, 1 specimen (Lang and Chapin Coll.).

The shell is imperforate, turrited, contracted near the summit, pale olive-buff. The summit is rounded; the embryonic shell of three whorls is subcylindric and smooth, the diameter at the second whorl about 1.25 mm. Subsequent whorls enlarge regularly, and have sculpture of close, regular, somewhat oblique rib-striæ which are a little emphasized below the suture, about seven striæ in one millimeter on the face of the last whorl. The striæ are much narrower than their intervals, the latter having a sculpture of transverse wrinkles, appearing like spiral striæ under a lens of low power. The suture is minutely crenulated. Aperture rhombic, the outer lip very slightly arching forward, narrowly reflected. The columella is vertical, its edge reflected and adnate above, rather thick and free below.

Length, 14.8 mm.; diameter, 4.4 mm.; length of aperture, 4.2 mm.; 9½ whorls.

This species has a distinctive feature in the spiral sculpture of the intercostal intervals. Unfortunately the type was somewhat broken after description, in removing the animal, which had been hardened in formalin.

100. **Streptostele bequaerti,** new species

Plate XXI, Figure 4

Luvunu near Masisi, type locality, 2 specimens; Mukule, 1800-2000 m., 1 specimen (Bequaert Coll.).

The shell is perforate, turrited, whitish-translucent. First two whorls smooth and glossy, the remainder regularly, closely and finely striate, the striæ a little emphasized just below the suture, disappearing at the base. The whorls are rather weakly convex. Aperture trapezoidal, vertical, the outer lip narrowly reflected, arching forward in the upper part, receding to the suture and base. The vertical columella is slightly excavated at the base, its reflected edge half covering the perforation.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
13.0 mm.	4.0 mm.	3.8 mm.	9	Type
12.4	4.2	3.8	9	Mukule

The figure is stouter than in *S. costulata*, *S. streptosteloides* or *S. centralis*.

101. **Streptostele centralis,** new species

Plate XXI, Figures 5 and 5*a*

Ituri Forest: Penge, 30 specimens, type locality. Mbisi near Masisi, 2 immature specimens (Bequaert Coll.).

The shell is narrowly perforate, turrited, semitransparent, very pale buff or whitish, very glossy. The summit is obtuse and rounded; the first three whorls are smooth, forming the semiglobose embryonic shell, which has a diameter of about 1.2 mm. The post-embryonic whorls are rather convex, and have a sculpture of very weak, slightly oblique striæ, regularly spaced but of somewhat unequal prominence. At the suture the striæ are strengthened to form a well-developed, very close crenulation. The aperture is subrhomboidal; outer lip thin, slightly blunt, and perceptibly expanded. The columella is somewhat twisted spirally, and its very shortly free outer edge overhangs and covers half or two-thirds of the very short umbilical fissure.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
11.4 mm.	3.5 mm.	3.2 mm.	8¾	Type specimen
11.5	3.4	3.2	9	

There is some variation in contour, stouter and more slender individuals occurring in all the lots, but the differences are small. In some examples the columella is nearly straight.

Opeas streptosteloides v. Martens, from the Buddu coast of Lake Victoria Nyanza, Uganda, which Thiele has found to be an immature *Streptostele*, appears closely related to this species, but no subsutural crenulation is mentioned or figured, and there are various other discrepancies.

S. exasperata Preston[1] is more distinctly costulate and tapers to a smaller summit; whether perforate or not Preston does not state. *S.*

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[1] 1912, Rev. Zool. Afric., I, p. 322, Pl. xvii, fig. 11. Mt. Kenia, 6000-9000 feet.

simplex Smith is a smaller form with the same number of whorls, and imperforate. *S. costulata* v. Martens is more conic, and apparently has stronger sculpture.

102. **Streptostele centralis coloba,** new subspecies

Plate XXI, Figure 8

Ituri Forest: Penge, type locality, 40 specimens; and Avakubi, 10 specimens (Bequaert Coll.).

The shell resembles *S. centralis* closely, but differs by the smaller size and narrower contour. The columella is straight and oblique.

Length, 9 mm.; diameter, 2.7 mm.; length of aperture, 2.6 mm.; 8 whorls.

This form is so similar to *S. centralis* that I would not separate them were it not that there are no intermediate examples in the large series of both. In one vial, *S. centralis* and *coloba* were found together, a circumstance probably indicating specific diversity. Immature *S. centralis* are readily separable from *coloba* by their more conic, broader form.

A very closely related form was taken at Medje by Lang and Chapin. It is a little smaller and more conic, but without a series to show the differences to be constant, its racial status is uncertain.

A single specimen from Rutshuru, taken by Bequaert, is a little more slender and smaller than adult *coloba;* yet, here too, further material is required.

103. **Streptostele dautzenbergi,** new species

Plate XXI, Figure 7

Ituri Forest: Penge, 2 specimens (Bequaert Coll.).

The shell is imperforate, turrited, whitish under a thin pale buff cuticle. The first two whorls are smooth; the diameter at the second whorl is 0.65 mm. Those following have a regular sculpture of slender, vertical rib-striæ about half as wide as their smooth intervals. In a specimen 8.4 mm. long there are nine striæ in one millimeter on the face of the last whorl. In a shell 6.7 mm. long there are six or seven. On the last whorl the striæ do not extend above the base. The suture is deeply impressed. The whorls are not very convex. The aperture is trapezoidal. Outer lip slightly expanded, a little retracted above. The columella is vertical and straight.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
8.4 mm.	2.1 mm.	1.9 mm.	9	Type
6.7			8	Immature

S. alluaudi Dautzenberg and Germain has finer sculpture, a curved columella, and apparently is larger at the summit. *S. costulata* var.

minor v. Martens, from Karevia, as figured by Thiele[1] resembles this species closely. I suspect that it will prove identical. The name *minor* is preoccupied, however, for a form referred to *S. fastigiata* as a variety,[2] and it cannot be used again in this connection.

104. **Streptostele bacillum,** new species

Plate XXI, Figure 9

Ituri Forest: Penge, 1 specimen (Bequaert Coll.).

The shell is imperforate, tapering very slowly to the large rounded summit, which is hemispherical and appears to be smooth. The post-nuclear whorls are slightly convex, with sculpture of inconspicuous, somewhat arcuate wrinkles, low, rather widely spaced. The suture is slightly crenulated by them. The last two whorls are flattened in the middle, the last one being rounded beneath. The aperture is subtrapezoidal. The columella is rather thick and very lightly sinuous, continuous below with the basal border.

Length, 3.75 mm.; diameter at end of first whorl, 0.55 mm.; at last whorl, 1.15 mm.; length of aperture, 0.9 mm.; 7 whorls.

The sole example of this little snail is bleached, yet the shape is so characteristic that it should be recognized easily. The riblets are lower and much less conspicuous than in *S. dautzenbergi.*

Subgenus **Raffraya** Bourguignat

Raffraya Bourguignat, 1883, Ann. Sci. Nat. Zool., (6) XV, p. 66 (as a genus).
Ischnostele C. Bœttger, 1915, Zool. Jahrb., Abth. f. Syst., XXXVIII, p. 373. Type: *I. leroii* C. Bœttger.

Streptostele with the outer lip somewhat sinuous or straightened, thickened or toothed within above the middle; the basal and columellar margins of the peristome are rather broadly reflected; the shell is perforate, ribbed, with smooth embryonic whorls.

Type: *Raffraya milne-edwardsi* Bourguignat.

S. milne-edwardsi has a minute parietal tooth as in *S.* (*Tomostele*) *congoris; S. horei* has a small angular nodule or two; *S. leroii* has none. In other characters these forms are substantially alike. In my opinion it would be trivial to base genera or subgenera upon the presence or absence of these small, vestigial teeth. In the Streptaxidæ, as in Pupillidæ and Helicidæ, there are notable differences in the size and number of teeth among closely related species.

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[1] 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 176, Pl. IV, fig. 4.
[2] Tryon, 1885, Man. of Conch., (2) I, p. 108.

S. costulata v. Martens and *S. dautzenbergi*, new species, are somewhat transitional between *Raffraya* and the West African group of *Streptostele.*

105. **Streptostele (Raffraya) horei** Smith

Plate XXI, Figures 6 and 6*a*

Streptostele horei E. A. Smith, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 95 (type locality: near Lake Tanganyika). Ancey, 1904, Journ de Conchyl., LII, p. 290 (states that *Ennea albida* Putzeys is a synonym).

Ennea albida Putzeys, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lvi, figs. 5 and 6. Dupuis and Putzeys, 1901, *op. cit.*, XXXVI, p. xli, figs. 15 and 16. Germain, 1907, Bull. Mus. Hist., Nat. Paris, p. 425.

Streptostele albida Putzeys. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 12.

Nyangwe (type locality of *Ennea albida* Putzeys, on the soil in coffee plantations; also in crevices of the bark of mangos; Dupuis Coll.; Bequaert Coll.); Kakombo (between Kikondja and Ankoro; Bequaert Coll.). Germain reports it from Brazzaville, underneath bark of trees.

Stanleyville, 2 specimens (Lang and Chapin Coll.).

The identity of Putzeys' species with that of Smith has been affirmed by Ancey and admitted by Dupuis and Putzeys in a manuscript note on the writers' copy of their 1901 paper. The only difference appears to be in size, the length of *horei* being given as 6 mm., of *albida* as 8 mm. In the lot before me from Nyangwe the length varies from 7 to 8 mm.; those from Stanleyville are 8 mm. long, of 8½ whorls. Two examples from this locality are figured.

It differs from other species of,the genus described herein by the well-reflected peristome, with a thickening or blunt tooth above the middle of the lip, defining a distinct, somewhat retracted sinulus. There is a small, transverse tubercular angular tooth, its left end curving inward in a very low extension, in some examples; in others the inward extension is separated as a distinct but very low tooth. There are 2½ smooth embryonic whorls.

As Germain suggests, this species occurs probably throughout the basin of the Congo.

Subgenus **TOMOSTELE** Ancey

Tomostele Ancey, 1885, Bull. Soc. Malacol. France, II, p. 143, as a genus for *Achatina muscola* (=*musœcola* Morelet).

Eustreptostele Germain, 1915, Bull. Mus. Hist. Nat. Paris, p. 285, as a subgenus for *Streptostele truncata* Germain.

Streptostele having the columella truncate at the base, as in *Subulina*. Type: *Achatina musæcola* Morelet.

Besides the type, *S. moreletiana* Dohrn of Prince's Island and *S. truncata* Germain of Fernando Po belong to this group. All of these are quite small species. The central African *S. elegans* (Dautzenberg and Germain) described as a *Prosopeas*, is a larger snail having the essential feature of *Tomostele*.

The characters given for the subgenus *Eustreptostele* are identical with those of *Tomostele:* "Les espèces de ce nouveau sous-genre diffèrent des vrais *Streptostele* par leur columelle tronquée et leur test fortement costulé."

106. **Streptostele (Tomostele) congoris**, new species

Zambi, 1 specimen (Bequaert Coll.).

The shell (Fig. 66 *a* and *b*) is slender (diameter contained 3½ times in the length), imperforate, grayish white, glossy. The summit is slightly obtuse, the first 2½ whorls smooth, convex. Subsequent whorls are moderately convex, joined by a deeply impressed suture, and sculptured with longitudinal ribs not half as wide as their intervals, projecting at the suture above, weakening near that below. The ribs arch forward somewhat below the suture, then become vertical; on the last whorl they are shorter, not reaching the periphery; on the front of the last whorl there are 12 ribs in one millimeter. The aperture is piriform. The outer lip is blunt, slightly thickened, arching forward rather strongly, being most prominent at the upper third, retracted thence to the suture. In the lower part it expands slightly. The columella is deeply concave and conspicuously truncate basally, curving into the parietal callus above. This is particularly thick, and bears a weak nodule near the middle, another near the insertion of the outer lip.

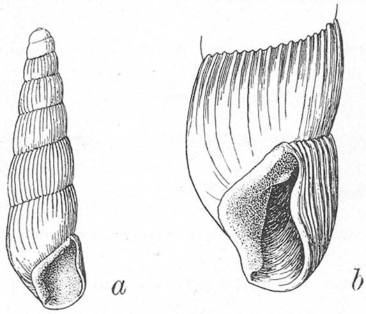

Fig. 66. *a* and *b*, *Streptostele congoris*, new species.

Length, 5.6 mm.; diameter, 1.55 mm.; length of aperture, 1.5 mm.; 8 whorls.

It is much more slender than *S. musæcola*, with the outer lip more curved, the columella more concave and the parietal callus thicker. It is most nearly related to *S. moreletiana* Dohrn,[1] of Prince's Island, but differs by having more whorls in a shorter shell, a less rapidly tapering spire, and coarser, more spaced ribbing.

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[1] *Streptostele moreletiana* Dohrn, 1866, Malak. Blätter, XIII, p. 132, Pl. V, figs. 17-19.

S. truncata Germain,[1] from Fernando Po, is smaller, with linear suture, very strongly marginate, the oblique riblets being conspicuously accentuated on the margin.

107. **Streptostele (Tomostele) musæcola** (Morelet)

Plate XXI, Figure 11

Achatina musœcola MORELET, 1860, Journ. de Conchyl., VIII, p. 190 (type locality: Guinea, in stipite musarum).
Tomostele muscola ANCEY, 1885, Bull. Soc. Malacol. France, II, p. 143.

Stanleyville, 3 specimens (Lang and Chapin Coll.).

The shell is imperforate, slender, turrited, tapering from the last whorl, crystalline. First two whorls smooth; subsequent whorls having a sculpture of strong, smooth, rounded ribs, not as wide as the intervals, which are smooth. On the penult whorl there are about 7 ribs in one millimeter. The upper ends of the ribs crenulate the suture. On the last whorl the ribs weaken at the periphery and are only weakly and in part indicated on the base. The whorls are moderately convex. The aperture is imperfectly trapezoidal. The outer lip is blunt, a little thickened and straightened or bent inward in the middle. The basal margin is rounded, well expanded. Columellar margin subvertical, nearly straight above, having a convex fold below, deeply excised at the base. The parietal callus is rather thick, and in fully adult shells it has a scarcely noticeable thickening near the termination of the outer lip.

Length, 5.5 mm.; diameter, 1.8 mm.; length of aperture, 1.6 mm.; 7 whorls.

The specimens occurred with *Subulina angustior*, *Pseudopeas saxatile*, and *Streptostele horei*. Hitherto, this species has not been reported from any inland locality, so far as I have been able to learn.

Ancey has supplemented Morelet's description with useful notes. The species was first referred to *Streptostele* by Nevill. It has not been figured hitherto.

GRAPTOSTELE, new subgenus

The embryonic whorls are engraved with microscopic spiral lines; there is no axial sculpture. The outer margin of the peristome is strongly arched forward and has a blunt, smooth finish, but is not expanded. Type: *Streptostele teres*, new species.

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[1] *Streptostele* (*Eustreptostele*) *truncata* Germain, 1915, Bull. Mus. Hist. Nat. Paris, p. 286. This number was received at The Acad. Nat. Sci. Philadelphia, February 16, 1917.

108. **Streptostele (Graptostele) teres,** new species

Plate XXI, Figure 10

Mt. Ruwenzori: western slope in the Lanuri Valley, at about 3500 m. (Bequaert Coll.).

The shell is imperforate, cylindric in the lower two-thirds, the upper third slowly tapering to the large, rounded summit. The surface appears opaque, smooth and glossy; but under the microscope, fine but clearly engraved spirals may be seen. Relative to their width they are rather widely spaced, from .05 to .035 mm. apart on the face of the last whorl. They become obsolete in the peripheral region, and are lacking on the base. They begin on the first whorl. The color is ecru-olive,[1] showing a few narrow darker lines of growth arrest on the last two whorls. The whorls are weakly convex, the suture even and moderately impressed. The embryonic 1⅓ whorls form a hemispherical summit, a darker line marking its limit. The aperture is piriform. Columella slightly twisted and very weakly, obliquely subtruncate at its base. The outer lip has a smooth, blunt, rounded edge; in profile view it is seen to project forward in a rounded lobe, prominent in the median third of its length, retracting above and below.

Length, 4.5 mm.; diameter, 1.6 mm.; diameter at second whorl,0.9 mm.; length of aperture, 1.3 mm.; 7 whorls.

I do not know of any shell closely resembling this species. Three specimens were obtained, but two of them are more or less broken.

Other Species of *Streptostele* Recorded from the Belgian Congo

Streptostele alluaudi (Dautzenberg and Germain)

Streptostele alluaudi DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 12, Pl. II, figs. 1 and 2.

Type locality: Kisantu (Bequaert Coll.).

Streptostele costulata v. Martens

Streptostele costulata E. v. MARTENS, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 178; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 340. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 176, Pl. IV, fig. 3.

Type locality: Butumbi (Stuhlmann Coll.).

Streptostele limpida (v. Martens)

Opeas limpidum E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 127, Pl. V, fig. 31.

Streptostele (?) *limpida* v. Martens. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 177.

Type locality: Bukende in the Semliki Valley (Stuhlmann Coll.); a young specimen from Migere in Butumbi belongs probably also to that species.

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[1] The color and opacity may have been influenced by preservation in alcohol.

Streptostele minor (v. Martens)

Streptostele costulata var. *minor* E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 34, Pl. II. fig. 33 (according to Thiele).

Streptostele minor v. Martens. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 176, Pl. IV, fig. 4.

Type locality: Karevia in the Semliki Valley (Stuhlmann Coll.). Young specimens probably belonging to this also from Buddu, Bugundi, and Bundeko (Stuhlmann Coll.).

This form is probably identical with my *S. dautzenbergi* (see above) and, as Thiele admits, specifically distinct from *S. costulata*.

Streptostele streptosteloides (v. Martens)

Opeas streptosteloides E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 127, Pl. V, fig. 30 (type locality: coast of Buddu on west side of Lake Victoria Nyanza).

Streptostele streptosteloides v. Martens. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 176, Pl. IV, fig. 2.

Island Kwidjwi (Schubotz Coll.).

Streptostele (*Tomostele*) *elegans* (Dautzenberg and Germain)

Prosopeas elegans DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 37, Pl. II, figs. 3 and 4.

Niemba Kunda near Kiambi, and Lukonzolwa (Bequaert Coll.); type locality not designated.

From the excellent description and figures it is evident that this species is no *Prosopeas*, but a *Tomostele*, differing from *S. musæcola* by the greater size: length, 11 mm.; diameter, 3.3 mm.; 7 whorls.

VARICOSTELE, new genus

The shell is lanceolate, glossy, streptosteloid, having inconspicuous varices or lines of growth-arrest. The aperture is ovate, the outer lip thin and sharp, unexpanded, not retracted above; columella vertical, rounded, not truncate.

The radula has a well-developed central tooth and lanceolate laterals, the basal plates with three posterior angles; the size increasing from the middle outwards, then rapidly diminishing (Fig. 67).

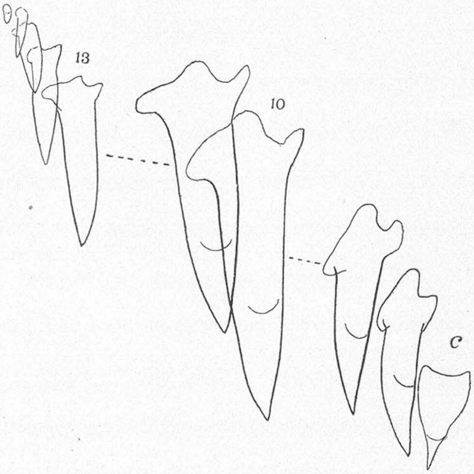

Fig. 67. Teeth of *Varicostele bequaertiana*, new species.

The male organs are very large relative to the female. The penis bears an appendix as long as itself (Fig. 68*b*).

Type: *Varicostele bequaertiana*, new species.

The shell is separable from *Streptostele* by its thin, sharp lip, that of *Streptostele* being more or less thickened, or with a smooth finish, usually expanded a little, and more or less retracted towards the suture. The sharp, unfinished lip seems significant, as it denotes a lower grade of specialization of the shell than in other African genera of Streptaxidæ, similar to the immature stages of *Streptostele* and other genera.

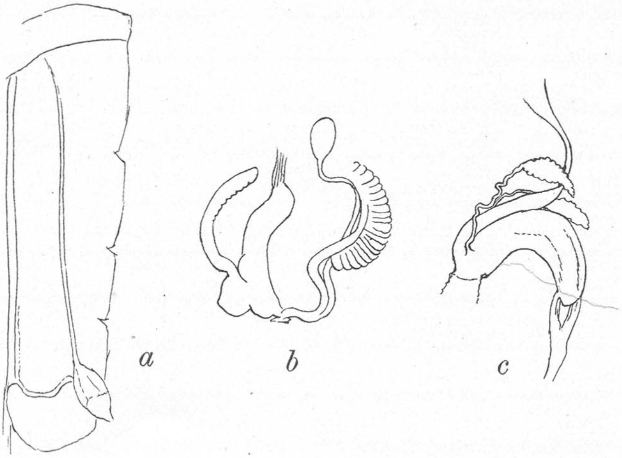

Fig. 68. *Varicostele bequaertiana*, new species: *a*, lung; *b*, genitalia; *c*, buccal mass.

Obeliscella shows no "varices," and the lip though thin has a smooth finish in the adult stage.

Key to Species of *Varicostele*

1. Surface smooth except for occasional growth-arrest streaks; diameter contained about three times in the length. Mt. Ruwenzori. . *V. bequaertiana*, new species.
   Surface finely striate vertically...2.

2. Striation weak; diameter contained 3.6 times in the length. Lesse (Semliki Valley).......................................*V. lessensis*, new species.
   Striation distinct...3.

3. Aperture contained 3⅓ to 3¼ times in length. Mt. Ruwenzori.
   V. subvaricosa (v. Martens).
   Aperture smaller, 3⅔ to 4 times in length: shell more slender. Rutshuru.
   V. rutshuruensis, new species.

109. **Varicostele bequaertiana**, new species

Mt. Ruwenzori: western slope in the Lanuri Valley at about 3500 m., 6 specimens (Bequaert Coll.).

The shell (Fig. 69) is lanceolate, imperforate, thin but rather strong. Lines of growth are scarcely visible on the brilliantly glossy surface, which, however, is broken by numerous varices or growth-arrest stripes, usually four to six on the last two whorls, often up to nine or ten on some earlier whorls. These varices are olive-yellow, on a deep colonial buff ground. The apex is rounded but small, the early whorls smooth, without varices on the first 2½. In the adult specimens seen the apical whorls have been lost, leaving an irregular break. The even suture shows no margin. The whorls are all moderately convex. The aperture is ovate, very little oblique, pale gray within, the varices showing as white stripes. The columella is white, vertical, somewhat thickened, the edge a little irregular. The outer lip is thin and sharp, and in a profile view it is seen to arch gently forward, the basal margin being retracted a little.

Length, 17.6 mm.; diameter, 6 mm.; length of aperture, 6.1 mm.; 6⅓ whorls, probably at least 2 having been lost.

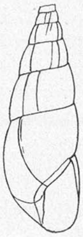

Fig. 69. *Varicostele bequaertiana*, new species.

This species differs from *V. subvaricosa* by the less slender contour and the smooth surface. As the four adult shells all have the apex amputated, and a young one 14.6 mm. long, of 7⅔ whorls, already shows some pitting of the first whorl, I presume that the mutilated condition is normal. There is no convex or tongue-like plug, such as the truncated Achatinidæ have. The apex has been described above from a young shell 11 mm. long, in which it remains perfect.

In its general appearance, this species resembles *Nothapalus paucispira xanthophaes*, which, however, has no varices.

The lung (Fig. 68*a*) is long and narrow without macroscopic venation aside from the pulmonary vein. The kidney is broad and as short as the pericardium, as usual in Streptaxidæ.

The penis is large and cylindric with a terminal retractor. It contains one large pilaster, and in the upper fourth two short ridges. The appendix is inserted near the base. It is as long as the penis and is swollen basally (Fig. 68*b*). The buccal mass is very large. Salivary glands separate, on long ducts (Fig. 68*c*).

There are about 16, 1, 16 radular teeth. The central tooth is wide with a small cusp. The laterals increase in size to the tenth, after which they diminish, the outer four being quite small (Fig. 67).

110. **Varicostele subvaricosa** (v. Martens)

Plate XXIII, Figure 15

Opeas subvaricosum E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 126, Pl. v, figs. 21 and 29.

Obeliscella subvaricosa E. v. Martens, 1897, *op. cit.*, p. 296.

Streptostele subvaricosa v. Martens. J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 175, fig. i (teeth, on p. 176), Pl. iv, fig. 1.

Mt. Ruwenzori, on the western slope (type locality), in the Butagu Valley, at 2000 and 3100 m. (Stuhlmann Coll.).

Mt. Ruwenzori: western slope in the Butagu Valley, at about 2200 m., 3 specimens; also at about 1800 m.; and in the Lamia Valley at 2000 m., a few immature specimens (Bequaert Coll.).

The specimens agree well with v. Martens' description but not so well with his figure 29, which is quite out of drawing, if my identification is correct, the suture being represented as too oblique, and the shape of the aperture wrong for these specimens.

There are about 13 striæ in 1 mm. on the ventral face of the last whorl. They do not extend upon the base. The varices are slightly raised bands about twice as wide as the striæ.

Length, 15 mm.; diameter, 4.5 mm.; length of aperture, 4.5 mm.; 10 whorls:

The type measures: length, 17 mm.; diameter, 5 mm.; aperture, scarcely 5 mm.; 10 whorls.

There is a larger form which may be called **Varicostele subvaricosa major**, taken on Mt. Ruwenzori, in the Butagu Valley, at about 3000 m. by Bequaert, having tea-green varices on an olive-buff ground. Length, 18 mm.; diameter, 5.4 mm.; aperture, 5.6 mm.; 10 whorls (Pl. XXIII, fig. 16). A young shell which appears referable to this form was taken in the valley of the Lamia (Ruwenzori West) at about 2000 m.

111. **Varicostele rutshuruensis,** new species

Plate XXIII, Figure 13

Rutshuru, in the forest gallery along the Rutshuru River, 10 specimens (Bequaert Coll.).

The shell is slender, turrited, yellowish glaucous, imperfectly transparent, glossy. Initial 2 whorls are smooth, the rest moderately convex, sculptured with very fine, close, regular and smooth vertical striæ, and on the later whorls a few growth-arrest marks, occupying the place of two or three striæ, and at unequal intervals. On the face of the last whorl there are 14 or 15 striæ in one millimeter; below the periphery they become subobsolete. The thin outer lip curves forward slightly. The columella is vertical; its reflected edge is closely appressed above, but downwards a slight crevice is noticeable.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
13.4 mm.	3.8 mm.	3.6 mm.	10	Type
15.0	4.0	3.8	10½	
14.0	3.9		10	

This species stands close to *V. subvaricosa*, but is readily distinguishable by the narrower shape and smaller aperture. The vertical striation is more distinct and coarse than in *V. lessensis*.

112. **Varicostele lessensis,** new species

Plate XXIII, Figure 14

Semliki Forest: Lesse, 3 specimens (Bequaert Coll.).

The shell is slender, turrited, pale buff, glossy. Embryonic shell of 2½ whorls, smooth, its termination marked by a delicate line. Subsequent whorls are evenly convex, with sculpture of very fine, close, regular, and smooth striæ, which bend back just below the suture, and are but little raised. They weaken or become obsolete towards the lower suture of each whorl, and do not pass upon the median part and base of the last whorl. There are about 17 striæ in one millimeter on the face of the last whorl. There are also a few irregularly spaced growth-arrest marks, only weakly to be seen on the upper whorls, but those on the last whorl are conspicuous, slightly brownish and grooved. The aperture is somewhat trapezoidal, the outer lip thin and sharp, very slightly arching forward. The columella is slender, straight, vertical, white.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
12.3 mm.	3.4 mm.	3.2 mm.	9½	Type
11.6	3.2	3.1	9½	

It is perceptibly more slender than the other species, but stands close to *V. rutshuruensis*. The striation is decidedly weaker and finer in *lessensis*, the surface having a varnish-like gloss.

PTYCHOTREMA Mörch

Ptychotrema MÖRCH, 1852, Catal. Yoldi, p. 33, for *P. guineensis* Mörch (without description).

Ptychotrema (Mörch) PFEIFFER, 1853, in Küster's Conchyl. Cabinet, p. 192, Pl. LVI, figs. 7 and 8; 1853, Monogr. Helic. Vivent., III, p. 370; under *Bulimus mörchi* Pfeiffer, new name for *Ptychotrema guineensis* Mörch.

Ptychotrema TRYON, 1885, Man. of Conch., (2) I, pp. 61 and 109, as a section of *Streptostele*, with *S. cyathostoma* (Pfeiffer) as type, and including *S. mörchi* (Pfeiffer).

Adjua CHAPER, 1885, Bull. Soc. Zool. France, X, p. 45, for *Adjua brevis* Chaper.
Excisa D'AILLY, 1896, Bihang Svenska Vet. Ak. Handl. Stockholm, XXII, 4, No. 2, p. 20, for *Ennea duseni* d'Ailly and *E. boangolensis* d'Ailly (as a section of *Ennea*).

This genus includes all of those snails commonly referred to *Ennea* which have one or two deeply, spirally entering, palatal folds, indicated externally by one or two spiral furrows on the back of the last whorl. The type is *Ptychotrema mörchi* (Pfeiffer).[1]

In the course of a somewhat wide acquaintance with "*Enneæ*" from Africa and the Orient, and with the literature of the group, I have failed to find any species transitional in structure between the groups *Ptychotrema* and *Gulella,* as herein limited. The subject will be clarified by ranking both as genera. Hitherto the enormous number of species in the heterogeneous genus *Ennea* has entailed a great deal of unprofitable labor upon the serious student of African snails.

It must be noted, moreover, that *Ennea* is a later name than *Ptychotrema.* It cannot lawfully be used to include the latter. As restricted to species agreeing with its type, *Ennea* becomes a subordinate group under *Ptychotrema.*

Key to the *Ptychotremæ* of the Belgian Congo

1. Aperture with 3 or more folds or teeth within the outer lip, some of them immersed, not reaching the lip; at least one suprapalatal fold; two spiral furrows on the back of the last whorl. Subgenus *Ptychotrema,* proper............2.
   Aperture with two entering palatal folds (the lower often immersed); no suprapalatal fold or tooth; two spiral furrows on the back of the last whorl. Subgenus *Ennea*..11.
   Aperture with only one entering palatal fold and one dorsal spiral furrow. Subgenus *Parennea*......................................16.

Ptychotrema, proper

2. Shell widest at the last whorl, the spire tapering to the wide, rounded or conic summit...3.
   Shell widest at the penult whorl or above, the spire not tapering; summit broadly rounded..8.
3. Four folds within the lip, the suprapalatal and basal smaller than the two long palatals; surface obsoletely costulate..............................4.
   Three folds in the outer-basal margin of the lip, a basal fold being wanting..5.

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[1] Mörch proposed *Ptychotrema* in 1852 for the then undescribed species *guineensis.* The name cannot be given earlier date than 1853 when Pfeiffer renamed, described, and figured the type species as *Bulimus mörchi,* considering the former name invalidated by *Bulimus guineensis* Jonas. He placed *Ptychotrema guineensis* Mörch in the synonymy of *B. mörchi* with a note stating that his description was from Mörch's specimen.

4. Three teeth on the columella; 16 to 18 mm. long. . *P. quadrinodatum* (v. Martens).
Two teeth on the columella; 15 mm. long. . . *P. katangense* Pilsbry and Bequaert.

5. Sculpture weak and unevenly developed or almost wanting; summit rounded. 6.
Distinctly ribbed or rib-striate; summit conic; 3 columellar teeth. . . . . 7.

6. Shell nearly smooth; 4 teeth on the columella; 11-14 mm. long.
P. geminatum (v. Martens).
Shell weakly, irregularly rib-striate; but slightly tapering; 3 teeth on the columella; 8.5 × 3.4 mm. . . . . *P. walikalense*, new species.

7. Regularly, closely rib-striate, 8-9 mm. long. . . . . . . *P. runsoranum* (v. Martens).
Having somewhat spaced riblets; 5.7 × 2.2 mm. . . . . *P. sororcula*, new species.

8. Large, solid species; diameter, 5 to 6 mm.; length, 11 to 14 mm.; the summit very broad; 3 columellar teeth, the upper one an entering lamella. . . . . 9.
Small species, the diameter less than 3 mm. . . . . 10.

9. Two or three teeth on the columellar lip. . . . . . *P. limbatum* (v. Martens).
No teeth on the columellar lip (in front of the columella).
P. sublimbatum, new species.

10. Smooth, with crenulate suture; angular lamella thin and simple in front; 3 columellar teeth and one on the columellar lip; 5 to 5.5 × 2.3 mm.
P. myrmecoön, new species.
Rib-striate below the suture; angular lamella biramose in front; 4 columellar teeth; 4.2 to 4.7 × 1.8 mm. . . . . *P. edgarianum*, new species.

Subgenus *Ennea* H. and A. Adams

11. Shell rather slender, the diameter 2½ to 3 times in the length, tapering upward from the last whorl; costulate. . . . . 12.
Shell cylindric-oblong, less slender; columella with 1 to 3 teeth. . . . . 13.

12. Conic turrited; 4.5 × 1.5 mm.; aperture, 1.5 mm.; 7 whorls.
P. paradoxulum (v. Martens).
Slowly tapering; 3.7 × 1.3 mm.; aperture, 1 mm.; 6½ whorls.
P. fraterculus, new species.

13. Surface ribbed; embryonic whorls minutely striate spirally. . . . . 14.
Surface finely costulate; whorls flattened; 12 × 6.75 mm.
P. pollonerœ (Preston).
Surface finely striate; whorls strongly convex; 4.1 × 2.1 mm.
P. monotes, new species.

14. Whorls moderately convex; length, 5.4 to 6.2 mm. . . . . 15.
Whorls strongly convex; 2.8 to 3 mm. long. . . . *P. silvaticum*, new species.

15. Riblets rather widely spaced, 4 riblets and intervals in one mm. on the penult whorl. . . . . *P. bequaerti* (Dautzenberg and Germain).
Riblets closer, 5 to 6 riblets in one mm. on the penult whorl.
P. bequaerti thysvillense, new subspecies.

Parennea, new subgenus

16. Shell not ribbed, cylindric-oblong, with rounded, obtuse summit.........17.
Shell ribbed; oval or cylindric-oval.................................19.

17. Each whorl weakly folded and striate above, smoother below; 4.35 × 1.6 mm.; 7½ whorls..................................*P. cylindrus*, new species.
Whorls smooth, crenulate below the suture..........................18.

18. Two low columellar tubercles very deep within; 3.2 to 3.5 mm. long.
P. nyangweense (Putzeys).
One massive, rounded columellar tooth, deep within; 2.55 × 1.25 mm.
P. mukulense, new species.

19. Oval, with rather widely spaced ribs; summit conic, subacute; 3.6 × 2 mm.
P. æquatoriale, new species.
Delicately plicatulate; 5.4 × 2 mm.................*P. sulciferum* (Morelet).
Closely costulate; 7 × 4 mm...................*P. circumcisum* (Morelet).

Subgenus **PTYCHOTREMA**, proper

Ptychotremæ having a suprapalatal fold (sometimes immersed) or a suprapalatal tooth on the lip, defining the sinulus.

These are forms of West and Central Africa. Not enough is known of them, and especially of their early stages, for a definite classification, but the following arrangement is suggested.

a_1. Angular lamella interrupted.
  b_1. Shell widest below, the spire tapering upwards; a suprapalatal tooth on the lip; upper palatal fold emerging. .Section *Ptychotrema*, proper (1).[1]
  b_2. Shell oval, widest in the middle, the spire wide, with short, convexly conic summit; palatal and suprapalatal folds deeply immersed; furrows on the back shallow................Section *Ptychoön*, new section (2).

a_2. Angular lamella continuous, deeply entering.
  b_1. Sinulus narrow and long, forming a pleurotomoid sinus.
Section *Excisa* d'Ailly (3).
  b_2. Sinulus rounded or oval.
    c_1. Aperture having parietal and columellar lamellæ and teeth within the outer lip, at the conclusion of the nepionic stage; (adult stage having accessory apertural denticles)..........Section *Adjua* Chaper (4).
    c_2. Aperture having no parietal or palatal teeth in the nepionic or neanic stages.....................Section *Haplonepion*, new section (5).

(1) *Ptychotrema mörchi* (Pfeiffer) (=*Bulimus mörchi* Pfeiffer, *Ptychotrema guineensis* Mörch), of Guinea, is the only species known to belong to the typical section. Its young stages have not been described.

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[1] The numbers in parenthesis refer to the notes following the table.

(2) *Ptychoön*, new section; type, *P. affectatum* (Fulton) = *Ennea affectata* Fulton, 1902, Proc. Malac. Soc. London, V, p. 32 and 1915, *op. cit.*, XI, p. 236; *Ennea rosenbergiana* Preston, 1910, Proc. Malac. Soc. London, IX, p. 52, fig.; two hundred miles east of Loanda, Angola; the locality Zanzibar, for *E. affectata*, was doubtless an error. There are 2½ smooth embryonic whorls, after which the whorls are flat and carinate at the periphery, the carina weakening on the later whorls.

(3) *Excisa* d'Ailly, 1896, Bihang Svenska Vet. Ak. Handl., XXII, 4, No. 2, p. 20; type, *P. boangolense* (d'Ailly). The two species are both from the Kamerun.

(4) The supposed genus *Adjua* Chaper, was based upon *A. brevis* Chaper,[1] which is the nepionic stage of *Ptychotrema elimense* (Chaper).[2] *P. bassamense* (E. A. Smith)[3] has similar young, figured by Smith. The adult stage, in these forms, and in *P. assiniense* (Chaper), which belongs to the same section, has some accessory folds or teeth on the peristome, in addition to those present in all *Ptychotremæ*.

(5) *Haplonepion*, new section; type, *Ptychotrema quadrinodatum* (v. Martens). This species has no lamellæ or teeth in the nepionic and neanic stages. *P. geminatum* (v. Martens) has a columellar lamella in the neanic stage. This section is well developed in the Upper Congo and includes the following nine species, also *P. ujijiense* (Smith), from the east shore of Lake Tanganyika.

113. **Ptychotrema quadrinodatum** (v. Martens)

Ennea (*Ptychotrema*) *quadrinodata* E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 177; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 27, Pl II, fig. 24. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 177, Pl. IV, fig. 7.

Type locality: Bukende in the Semliki Valley (Stuhlmann Coll.).

Ituri Forest: Penge, 18 specimens (Bequaert Coll.).

The range in length is from 16 to 18.6 mm. In the neanic stage the columella is slightly thickened, nearly straight.

114. **Ptychotrema geminatum** (v. Martens)

Ennea (*Ptychotrema*) *geminata* E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 177; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 27, Pl. II, fig. 26. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 177, Pl. IV, fig. 8.

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[1] *Adjua brevis* Chaper, 1885, Bull. Soc. Zool. France, X, p. 44, Pl. I, fig. 4; Elima (Assinie).

[2] *Gulella elimensis* Chaper, 1885, *op. cit.*, p. 51, Pl. I, figs. 13-15; Elima (Assinie).

[3] *Ennea* (*Ptychotrema*) *bassamensis* E. A. Smith, 1893, Proc. Zool. Soc. London, p. 642, fig. 1; Abidjean (Grand Bassam).

Mt. Ruwenzori in the Butagu Valley, at 2600 m. in the bamboo forest; Butumbi; also from Manyonyo in Uganda (Stuhlmann Coll.; type locality not designated).

Mt. Ruwenzori: western slope, in the Butagu Valley, 20 specimens, at 1800 and 2200 m.; also Rutshuru, a variety, 12 specimens (Bequaert Coll.).

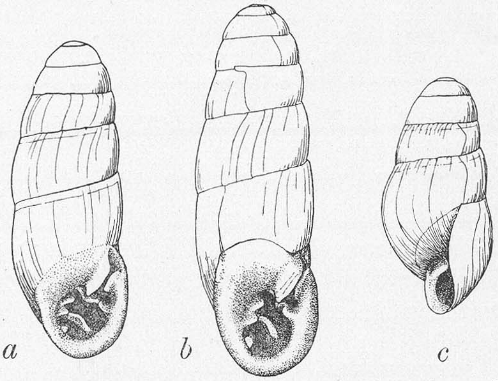

Fig. 70. *Ptychotrema geminatum* (v. Martens): *a* and *b*, adult shells; *c*, neanic stage.

The eighteen specimens from Mt. Ruwenzori all have a small denticle, deeply placed above the median pair of columellar lamellæ, and another where the columellar margin passes into the basal,—in all four on the columellar border (Fig. 70*a* and *b*). The upper palatal plica emerges to the lip, but the lower one stops one or two mm. short of it. There is a sharp-edged, obliquely descending suprapalatal tooth which defines a small, oval sinulus. The very long, angular lamella has sigmoid curvature. The surface is smooth except for a striate band below the suture. In the neanic stage, the outer lip retracts near the suture, and there is a strong columellar lamella (Fig. 70*c*).

Length	*Diameter*	*Number of Whorls*	
14 mm.	4.6 mm.	7	Fig. 70*b*
12	4.2	6¾	Fig. 70*a*

The specimens from Rutshuru are similar to those of Mt. Ruwenzori in teeth, but differ by having more or less fine striation back of the peristome.

Ptychotrema katangense Pilsbry and Bequaert (=*Ennea joubini* Dautzenberg and Germain), from the Katanga, is a related species from farther south.

115. **Ptychotrema runsoranum** (v. Martens)

Ennea (*Ptychotrema*) *runsorana* E. v. Martens, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 179.

Ennea (*Ptychotrema*) *runssorana* E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 28, Pl. ii, fig. 25. J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 178, Pl. iv, fig. 9.

Type locality: Karevia in the Semliki Valley at the western foot of Mt. Ruwenzori (Stuhlmann Coll.).

Ituri Forest: Medje (Lang and Chapin Coll.); Avakubi and Penge. Beni, in a forest gallery near the Semliki River (Bequaert Coll.).

Length: 8 to 9 mm.

Von Martens' figure is not very good, the spire being too attenuate in the upper part.

116. **Ptychotrema sororcula,** new species

Ituri Forest: Penge, 1 specimen (Bequaert Coll.).

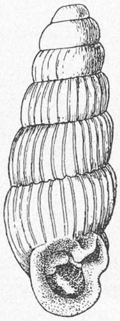

Fig. 71. *Ptychotrema sororcula,* new species.

The shell (Fig. 71) is much like a miniature *P. runsoranum.* It is oblong, the penult and last whorls about equal in diameter; tapering above and below them. The first 2½ whorls are smooth; the rest are rib-striate, the riblets narrower than the intervals, slightly crenulating the suture. The last whorl has two deep furrows, the upper longer and wider, reaching to the lip-expansion, the lower furrow sharply impressed, not extending so far forward. There is a long, shallow, oblique rimation. The aperture has a continuous peristome, emarginate over the angular-lamella, which is strong, weakly S-shaped, its crest showing three lobes separated by weak depressions. The columella has three very deeply placed denticles. The outer lip is retracted above, forming a rounded sinulus defined below by a blunt tooth. Below the sinulus the lip is expanded and reflected. The upper palatal fold is very long, terminating at the lip in a tooth, preceded by a depression. The lower palatal fold is immersed, not reaching the lip.

Length, 5.7 mm.; diameter, 2.2 mm.; 6 whorls.

It differs from *P. runsoranum* in little except the far smaller size and more widely spaced riblets.

117. **Ptychotrema walikalense,** new species

Walikale, 1 specimen (Bequaert Coll.).

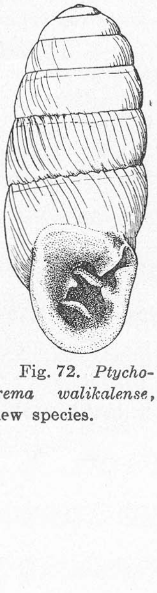

Fig. 72. *Ptychotrema walikalense,* new species.

The shell (Fig. 72) is transparent whitish, cylindric-oblong, the last two whorls of equal diameter, the preceding whorl slightly smaller, those above forming a convexly conic summit. The first 2½ whorls are smooth, the next very finely striate; subsequent whorls have weak, narrow, low and irregular ribstriæ, strong below the suture, elsewhere partially effaced; the last whorl having two spiral furrows, on the back and right side. The suture is somewhat crenulated. The angular lamella is weakly S-shaped. The rounded sinulus opens laterally, and is limited below by a short, oblique tooth on the lip. The upper palatal fold is a little enlarged at its termination, also the lower palatal, which is immersed, as usual. The columella bears three denticles deep within, the lower one blunter and more immersed than the others. The peristome is reflected and a little thickened within. The parietal callus is thin and transparent.

Length, 8.5 mm.; diameter, 3.4 mm.; 6⅔ whorls.

This species appears to be most nearly related to *P. geminatum* (v. Martens). It is smaller, more strongly sculptured, and lacks the fourth columellar denticle which I have found in all of the specimens of *geminatum* examined.

118. **Ptychotrema edgarianum,** new species

Mt. Ruwenzori: western slope, in the Butagu Valley at about 2200 m., type locality; also in the Lamia Valley at 2000 m.; abundant (Bequaert Coll.).

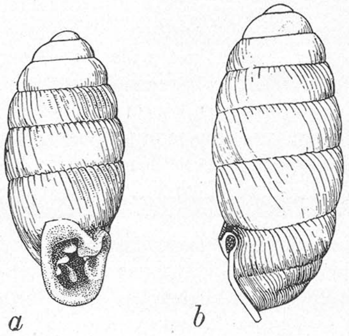

Fig. 73. *a* and *b*, *Ptychotrema edgarianum*, new species.

The shell (Fig. 73*a* and *b*) is oblong, widest at the penult whorl; the summit convexly conic, apex obtuse; transparent whitish, glossy. Sculpture consists of extremely weak, well spaced rib-striæ, which are strongly emphasized close below the suture, and are well developed behind the lip, but elsewhere scarcely noticeable under an ordinary hand-lens. Some irregular wrinkles in a spiral direction cross the intervals, in places. The last whorl has a long dorso-lateral spiral furrow, with a shorter one below it. The angular lamella is rather massive and triangular anteriorly, with a pit above it; but becomes thin within; at first straight, then deep within it curves to the left. The sinulus is small, opens laterally, and is limited by a low, obtuse tooth on the lip. The upper palatal fold terminates in a rather strong tooth at the lip, a slight depression between the tooth and the entering fold. The lower palatal fold is small and deeply immersed. The columella, deep within, bears three sharp teeth. The peristome is somewhat thickened and well reflected. The parietal callus ascends in a lobe on the penult whorl, higher than the upper margin of the angular lamella. The umbilical crevice is long, weakly bent like a reversed S.

Length	*Diameter*	*Number of Whorls*	
4.2 mm.	1.8 mm.	6	Type; Fig. 73*a*
4.7	1.9	6½	Fig. 73*b*

P. paradoxulum (v. Martens) is about as small, but it differs in shape of the spire and in sculpture. Named for the late Edgar A. Smith, I. S. O., one of the ablest workers on the African mollusk fauna.

In one lot from the Lamia Valley at about 2000 m., the striation and minute spiral wrinkling are much more distinct than in the type lot. In another lot from the Lamia Valley at the same elevation, the sculpture is typical, but there is unusual variation in size, the largest and smallest measuring: length, 4.6 mm.; diameter, 2 mm.; and length, 3.3 mm.; diameter, 1.5 mm.

119. **Ptychotrema limbatum** (v. Martens)

Ennea limbata E. v. MARTENS, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 178; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 26, Pl. II, fig. 23.

Type locality: Mt. Ruwenzori on the western slope in the bamboo forest of the Butagu Valley, at 2600 m. (Stuhlmann Coll.).

Mt. Ruwenzori: western slope, in the Butagu Valley at about 2200 m. (Bequaert Coll.).

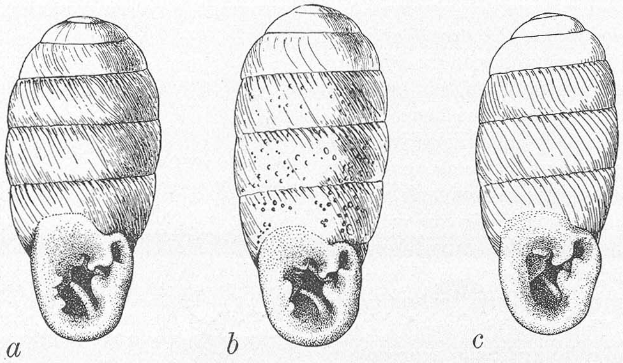

Fig. 74. *a* and *b*, *Ptychotrema limbatum* (v. Martens); *c*, *Ptychotrema sublimbatum*, new species.

The small teeth upon the inner edge of the columellar lip vary in fully adult individuals. There may be three, as in Fig. 74*a*; two, as in von Martens' type and Fig. 74*b*; or one large and one quite small one. As the original figures do not show all the teeth, two specimens are here illustrated, Fig. 74*a* a mature and Fig. 74*b* a quite old individual. The largest taken measures: length, 13.4 mm.; diameter, 6 mm. There are slightly over 7 whorls, about 3¼ forming the embryonic shell—or at least, these whorls have a far finer and very weak striation and even suture, the change in sculpture then coming abruptly.

120. **Ptychotrema sublimbatum,** new species

Mt. Ruwenzori: western slope in the Lamia Valley at about 2000 m., 3 specimens (Bequaert Coll.).

The shell (Fig. 74*c*) resembles *P. limbatum* closely, differing as follows: The shape is nearly cylindric, widest in the middle, and narrower than in *limbatum*. The aperture is smaller, more contracted, and there are no teeth on the inner edge of the columellar lip. The parietal callus runs somewhat higher on the penult whorl. There is a long, deeply entering lamella in the angle between columella and parietal wall, which is not present in *limbatum*.

The sculpture is practically the same as in *P. limbatum*. As in that, the furrows of the last whorl extend as far backward as the left side, and are very deep. The lip is very thick, reflected and recurved.

Length, 11.2 mm.; diameter, 5 mm.; 7 whorls.

121. **Ptychotrema myrmecoön,** new species

Ituri Forest: Avakubi, 1 specimen, type locality. Mbisi near Masisi, 5 specimens (Bequaert Coll.).

The shell (Fig. 75*a* and *b*) is cylindric-oblong, whitish, rimate, the crevice long, slightly curved in form of a reversed S. The summit is obtuse, rounded, the first 2½ whorls enlarging, the penult and last whorls of about equal diameter; the last whorl tapers downward and has two deep spiral furrows, the upper one longer, reaching to the lip-edge, the lower one shorter. The surface is nearly smooth, but some minute striation may be seen under strong magnification, particularly behind the outer lip, and below the suture there is a narrow border of vertical striæ. The angular lamella is S-shaped, and enters to the dorsal side. The sinulus is rounded, opens laterally, and is limited by a suprapalatal tooth. The upper palatal fold terminates in a strong lip-tooth, which is separated from the entering portion by a deep depression. The lower palatal fold is strong and immersed. The edge of the columella has two low nodules, very deep within, and there is a tooth at the inner edge of the columellar lip, opposite the upper palatal fold.

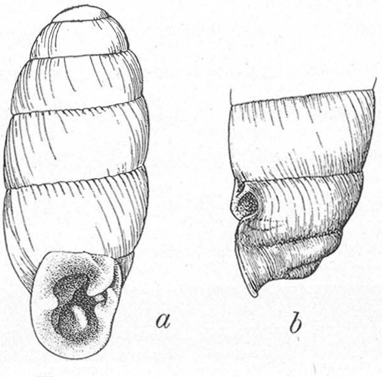

Fig. 75. *a* and *b*, *Ptychotrema myrmecoön*, new species.

Length	*Diameter*	*Number of Whorls*	
5.5 mm.	2.3 mm.	5½	Avakubi; type
5.0	2.3	5	Mbisi
5.4	2.3	5½	Mbisi

Subgenus **Ennea** H. and A. Adams

Ennea H. and A. Adams, 1855 (April), Genera of Recent Mollusca, II, p. 171 (as a subgenus, without designation of type; five species are enumerated, among them *elegantula* Pfeiffer). E. v. MARTENS, 1860, Die Heliceen, p. 302 (as a subgenus, with *Pupa elegantula* Pfeiffer designated as type).

Enneastrum PFEIFFER, 1856 (January), Malak. Blätter, II (1855), p. 173 (as a subgenus of *Ennea;* monotype: *Pupa elegantula* Pfeiffer).[1]

Carychiopsis E. v. MARTENS, 1895, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 122 (as a subgenus of *Ennea;* monotype: *Ennea paradoxula* v. Martens). Not *Carychiopsis* Sandberger, Land u. Süssw. Conchyl. Vorwelt, 1872, p. 169, for *Pupa dohrni* Deshayes.

Ptychotremæ having deeply entering upper and lower palatal folds, with two corresponding spiral furrows on the back, but no suprapalatal fold or tooth. Type: *Pupa elegantula* Pfeiffer.

The name *Ennea* has been used hitherto in a broad sense to cover *Edentulina, Ptychotrema, Gulella,* and similar forms; and *Enneastrum* has been used as a subgenus for the typical species of *Ennea.* Since the name *Ptychotrema* was published with a description and figures of the type species in 1853, it is obvious that it takes precedence, *Ennea* becoming a subgenus.

The type species of *Ennea, P. elegantulum* (Pfeiffer) is somewhat aberrant by having the angular lamella interrupted, its inward continuation represented by a series of two or three small tubercles. In all the other species examined by the writer, the lamella is continuous.

Ptychotrema (Ennea) bequaerti (Dautzenberg and Germain)

Ennea bequaerti DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 5, Pl. III, fig. 14.

Lisala and Malema; type locality not designated (Bequaert Coll.).

Though this species has been well described, the published photographic figure is indistinct, and does not show the characteristic teeth. In one of the original specimens from Lisala, which may be taken as type locality, there are slightly over two embryonic whorls, having microscopic sculpture of close, spiral striæ, minutely beaded. The angular lamella penetrates to the dorsal side. The upper palatal fold is high and sharp within, but abruptly diminishes to a mere trace near the lip, upon which it is represented by a re-entrant thickened angle. The lower palatal fold is dorsal, so deeply immersed that it cannot be seen in a direct front view. The columella has two weak, deeply placed nodules, a very weak, more immersed one below them. The riblets are rather widely spaced, four riblets and intervals in one millimeter on the face of the penult whorl.

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[1] According to the date given on p. 161 below, pp. 161-192 of volume II were issued January 1856.

Length, 6.1 mm.; diameter, 2.5 mm.; 7¾ whorls.

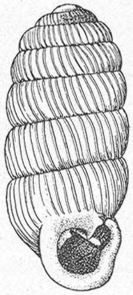

Fig. 76. *Ptychotrema (Ennea) bequaerti thysvillense*, new subspecies.

122. **Ptychotrema (Ennea) bequaerti thysvillense,** new subspecies

Thysville, in a cave (Lang and Chapin Coll.).

Similar to *P. bequaerti*, except that the inward continuation of the angular lamella is very low, and the ribbing is decidedly closer, there being 5½ to 6 ribs and intervals in one millimeter on the penult whorl (Fig. 76).

Length	*Diameter*	*Number of Whorls*	
6.2 mm.	2.6 mm.	7¾	Type
5.4	2.7	7¼	

123. **Ptychotrema (Ennea) fraterculus,** new species

Ituri Forest: Penge, 1 specimen (Bequaert Coll.).

The shell (Fig. 77*a*) is minute, rimate, pale buff, slender, tapering from the last whorl to the small obtuse summit. First 2½ whorls smooth, the rest costulate, the riblets slender, the intervals wide; on the face of the last whorl there are seven or eight riblets in one millimeter. The last whorl has two deep furrows on the back and right side, the upper one extending to the lip-edge, which is emarginate and projects forward at the termination of the furrow. The lower furrow is shorter and dorsal. The aperture is truncate-oval, the upper margin emarginate above the angular lamella. The peristome is expanded and well thickened within except near the insertion of the outer lip, where it retracts, forming an oval sinulus which is bounded below by a prominent boss of the inner margin of the lip, in line with the deeply entering upper palatal fold, with which it is weakly connected. The lower palatal fold is immersed and rather low. The columella bears two large nodules, deeply immersed. The angular lamella is very long and weakly S-shaped, entering to the dorsal side. The umbilical chink is shallow, rather long and oblique, nearly straight.

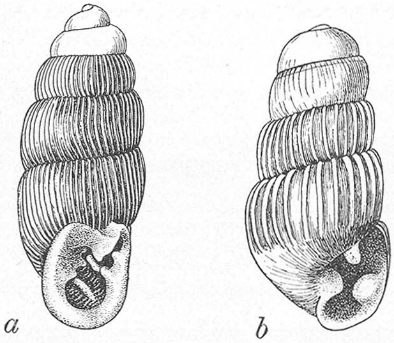

Fig. 77. *a*, *Ptychotrema (Ennea) fraterculus*, new species; *b*, neanic stage of an undetermined *Ptychotrema*, from Avakubi.

Length, 3.7 mm.; diameter, 1.35 mm.; length of aperture, 1 mm.; 6½ whorls.

This peculiar little species is closely related to the larger and more conic *Ennea paradoxula* v. Martens, from Karevia on the western spur of Mt. Ruwenzori; it may possibly prove to be a subspecies of that. *E. paradoxula* is described as conic-turrited, with the aperture one-third the length. *P. fraterculus*, while tapering, is scarcely conic, and the aperture is decidedly smaller relative to the length.

A single immature shell (neanic stage) taken at Avakubi is perhaps referable to this species, but the proportions of the embryonic whorls are not quite the same. It is figured (Fig. 77*b*) to call attention to the peculiar armature of the aperture. The shell is 2 mm. long, tapering to an obtuse, rounded summit. There are 2½ embryonic whorls, the first smooth, the second having very weak, fine axial striæ. The diameter across the second whorl is 0.65 mm. Subsequent post-embryonic whorls are vertically ribbed. There is a short, thick parietal lamella, a spirally entering columellar lamella and a large tubercle within the outer lip.

124. **Ptychotrema (Ennea) silvaticum,** new species

Ituri Forest: Penge, type locality. Also on Mt. Ruwenzori, western slope, in the Butagu Valley at about 2200 m. (Bequaert Coll.).

The shell (Fig. 78*a* and *b*) is oblong, pupiform, whitish buff, convexly conic above, the apex rather obtuse. First 2½ whorls have fine spiral threads; remaining whorls are vertically ribbed, the ribs narrow, straight, about six or seven in one mm. on the face of the penult whorl. The whorls are strongly convex, the suture deep. The last whorl tapers rapidly towards the base, its last half being flattened, with two deep spiral furrows, the lower one shorter. The angular lamella is long, but its inner end may be seen in the aperture. It is weakly sigmoid, almost straight. There is a minute, deeply placed parietal tubercle. The columella bears three teeth, very deeply immersed. There is a strong upper palatal tooth within the outer lip, continued inward in a sharp palatal fold, penetrating to the dorsal side. The lower palatal fold is smaller and does not reach the peristome. The peristome is reflected and slightly thickened within. The umbilical crevice is rather deep, short and straight.

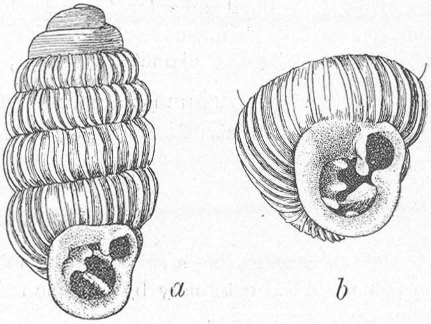

Fig. 78. *a* and *b*, *Ptychotrema (Ennea) silvaticum*, new species; *a* is the type specimen from Penge; *b* a specimen from the Butagu Valley at 2200 m.

Length, 3 mm.; diameter, 1.5 mm.; 6½ whorls (Fig. 78*a*); type.

It is somewhat related to *P. sororcula* by the sculpture, but differs entirely in shape.

A single specimen from Mt. Ruwenzori, in the Butagu Valley at about 2200 m., agrees in the main with this species, but it differs by being slightly smaller: length, 2.8 mm.; diameter, 1.35 mm.; 6½ whorls; the parietal callus is heavier and the ribs a trifle more widely spaced (Fig. 78*b*).

125. **Ptychotrema (Ennea) monotes,** new species

Ituri Forest: Penge, 1 specimen (Bequaert Coll.).

The shell (Fig. 79) is subcylindric-oblong, slightly wider above the middle, the summit obtuse, rounded. The first two whorls appear to be smooth; following whorls are finely, somewhat obliquely striate. The last whorl is more coarsely striate, about eight striæ in one millimeter on its ventral face—the penult whorl having about fourteen. The whorls are strongly convex, the last having a broad, long spiral sulcus on the back and right side, a much shorter and shallower one below it. The suture is well impressed, and ascends conspicuously to the lip. The angular lamella is thin, nearly straight, not very long. Deep within the columella bears one well-developed tooth, a much weaker one above it, and the slight trace of a third tooth below it. The upper palatal fold is sharp and strong within, but becomes much lower near the peristome, and is represented on the inner edge of the latter by a low prominence. The lower palatal fold is much smaller and deeply immersed. The peristome is expanded, the basal and outer margins reflected. It is somewhat thickened within. The umbilical crease is short and straight.

Length, 4.1 mm.; diameter, 2.1 mm.; 5½ whorls.

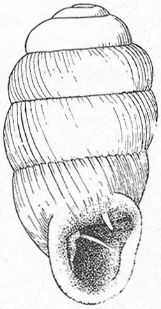

Fig. 79. *Ptychotrema (Ennea) monotes*, new species.

The single specimen collected is a "dead" shell. Perhaps fresh ones will show spiral striation of the embryonic whorls, as in some of the related species.

Parennea, new subgenus

Ptychotremæ having a single palatal fold (the upper palatal), deeply entering, its place marked externally by a single spiral dorsal furrow. Type: *Ptychotrema mukulense*, new species.

In this group the shell is small, oval to cylindric, like *Ennea* as herein restricted, but differing by the absence of a lower palatal fold with its corresponding dorsal furrow. It is restricted to tropical Africa, chiefly west of the great lakes to the Atlantic.

In addition to those described below the following species belong here:

Ptychotrema sulciferum (Morelet) = *Ennea sulcifera* MORELET, 1883, Journ. de Conchyl., XXXI, p. 410, Pl. x, fig. 6; Landana.

Ptychotrema circumcisum (Morelet) = *Ennea circumcisa* MORELET, 1885, Journ. de Conchyl., XXXIII, p. 29, Pl. II, fig. 3; Toumby near Landana.

Ptychotrema uniliratum (Smith) = *Ennea unilirata* E. A. SMITH, 1903, Journ. of Conch., X, p. 315, Pl. IV, fig. 8; eastern Uganda.

Perhaps *Ennea syngenes* PRESTON, 1913, Proc. Zool. Soc. London, p. 216 (= *Ennea consobrina* Preston, 1911, Ann. Mag. Nat. Hist., (8) VII, p. 463, Pl. XI, fig. 1; not of Ancey), from Mt. Kenia, should be added, but its structure is not quite clear, either in description or figure.

126. **Ptychotrema (Parennea) nyangweense** (Putzeys)

Ennea nyangweensis PUTZEYS, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lvi, fig. 4.
Type locality: Nyangwe (Dupuis Coll.).

Rutshuru, in the forest gallery along the Rutshuru River, 2 specimens (Bequaert Coll.).

The shell (Fig. 80*a* and *b*) is cylindric, rounded at the ends, whitish, smooth save for slight traces of growth-lines and a short, regular crenulation below the suture, wanting on the first two whorls. The whorls are moderately convex, the suture somewhat impressed, crenulated, shortly ascending to the aperture. The last whorl has a deep spiral furrow across the back and right side, and is somewhat striate behind the outer lip. The angular lamella is rather long, nearly straight, its crest bilobed; at the anterior end it is somewhat thickened. The columella has a very deeply placed lobe bearing two low tubercles, not visible in a direct front view. The outer lip has a strong tooth, defining the oval sinulus, and continuous inward with a deeply entering, strong, palatal fold, which becomes somewhat lower before joining the lip tooth. The peristome is reflected and strongly thickened within, the margins connected by a moderate parietal callus. The umbilical crevice is short, rather deep, and narrowly looped at the end.

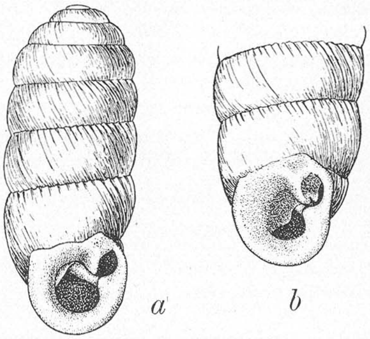

Fig. 80. *a* and *b*, *Ptychotrema (Parennea) nyangweense* (Putzeys).

Length	*Diameter*	*Number of Whorls*
3.2 mm.	1.5 mm.	7
3.5	1.45	7

This species is related to *P. uniliratum* (Smith) from eastern Uganda. It is more cylindric, smoother, with a much more strongly developed tooth within the outer lip. *P. syngenes* (Preston) differs by its shorter contour and sculpture.

127. **Ptychotrema (Parennea) mukulense,** new species

Mukule at from 1800 to 2000 m. in the mountains west of Rutshuru, 1 specimen (Bequaert Coll.).

The shell (Fig. 81*a* and *b*) is minute, whitish, cylindric-oblong, glossy, smooth except for very short, regular folds below the suture. Apex very obtuse. The earlier whorls are moderately convex, the last two less so; suture moderately impressed, somewhat crenulated, a little ascending at the end. The last whorl has a sharply impressed median spiral furrow over the back, running to the peristome. The aperture is rounded, truncate above. The angular lamella is compressed, nearly straight and not very long. The columella is subvertical, slightly arcuate in a front view, but when viewed obliquely from the right side a massive, rounded tooth is seen very deep within. There is a stout, bluntly conical tooth in the middle of the outer lip; from it a palatal fold runs inward, past the dorsal side; it is a little depressed near the lip. The peristome is reflected and a little recurved. The parietal callus is very thin. The umbilical crease is rather deep, and quite short.

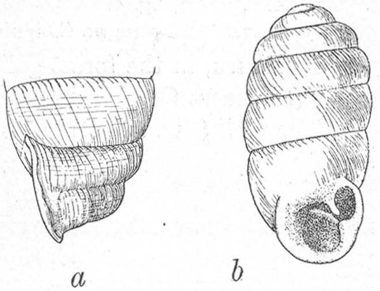

Fig. 81. *a* and *b*, *Ptychotrema (Parennea) mukulense*, new species.

Length, 2.55 mm.; diameter, 1.25 mm.; 6⅓ whorls.

This species is smaller than any of its allies, with the reflection of the lip particularly pronounced, though not broad.

128. **Ptychotrema (Parennea) cylindrus,** new species

Ituri Forest: Penge (Bequaert Coll.).

The shell (Fig. 82*a* and *b*) is cylindric, with rounded ends, the summit very obtuse. Upper whorls are moderately convex, the lower much more flattened; suture deeply impressed throughout, and ascending rather strongly to the lip. Sculpture of extremely weak folds and minute striæ in the upper half of each whorl, the

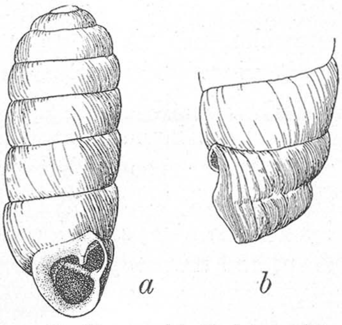

Fig. 82. *a* and *b*, *Ptychotrema (Parennea) cylindrus*, new species.

lower half or third being nearly smooth. The last whorl has a deep spiral furrow extending across the back from the middle of the left margin nearly to the peristome. The aperture is indistinctly triangular. The angular lamella is rather high, compressed, rather long and nearly straight, and emerges to the edge of the peristome. A large, bluntly conic tooth is upon the columella, so deep within that it can be seen in an oblique view only. There is a long, strong, deeply entering palatal fold, which does not emerge to the lip, but is represented there by a strong tooth, separated by a deep depression from the fold within. The outer margin of the peristome projects forward in the middle; the basal and columellar margins are expanded, somewhat thickened. The parietal callus is rather thick.

Length, 4.35 mm.; diameter, 1.6 mm.; 7½ whorls.

The long, narrow figure and nearly smooth surface distinguish this species.

129. **Ptychotrema (Parennea) æquatoriale,** new species

Ituri Forest: Penge (Bequaert Coll.).

The shell (Fig. 83*a* and *b*) is oval, the upper third conic; pale buff, with little luster. The apex is acute for a shell of this group; first two whorls are smooth, the rest ribbed, the ribs narrow, rather widely spaced; on the penult whorl there are six or seven in one mm. On the last whorl some irregular spiral striation appears in the intercostal spaces. The last whorl tapers downward, and has a rather deep, median spiral furrow running from the left side across the back to the peristome. The aperture is irregularly rounded. The angular lamella is slender, rather long and a little curved. The columella is concave in front view, but deep within it is straightened. There is a prominent, bluntly conic tooth in the outer lip, continued inward in a long, acute palatal fold, which penetrates almost to the ventral side of the last whorl. The peristome is reflected, a little thickened within, and is continued as a strong cord across the parietal wall. The umbilical crevice is short and nearly straight.

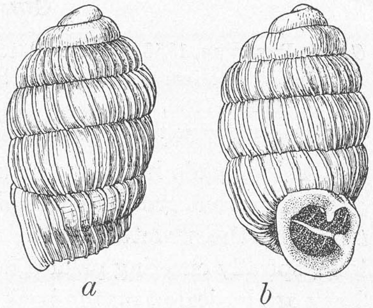

Fig. 83. *a* and *b*, *Ptychotrema* (*Parennea*) *æquatoriale*, new species.

Length, 3.6 mm.; diameter, 2 mm.; 5½ whorls.

The unusually pointed apex and the coarse sculpture are characteristic. It was found in some abundance.

Other Species of *Ptychotrema* Recorded from the Belgian Congo

Ptychotrema jeanneli (Dautzenberg and Germain)

Ennea jeanneli Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 7, Pl. III, figs. 9 and 10.

Type locality: Niemba Kunda near Kiambi (Bequaert Coll.).

Ptychotrema katangense Pilsbry and Bequaert, new name

Ennea joubini Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 3, Pl. iii, figs. 11 and 12.[1]

Type locality: Katolo (between Kiambi and Sampwe; Bequaert Coll.).

Ptychotrema paradoxulum (v. Martens)

Ennea (*Carychiopsis*) *paradoxula* E. v. Martens, 1895, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 122; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 29, Pl. ii, fig. 34.

Type locality: Karevia in the Semliki Valley, 1175 m. at the western foot of Mt. Ruwenzori (Stuhlmann Coll.).

Ptychotrema pollonerœ (Preston)

Ennea pollonerœ Preston, 1913, Proc. Zool. Soc. London, p. 213, Pl. xxxv, figs. 9 and 9*a*.

Type locality: near Lake Kivu, Belgian Congo (Kemp Coll.).

Probably also *Ptychotrema circumcisum* (Morelet) and *P. sulciferum* (Morelet), both from Landana (see p. 211), occur in the Belgian Congo.

Gulella Pfeiffer

Gulella Pfeiffer, 1856, Malak. Blätter, II, (1855), p. 173, as a subgenus of *Ennea* without designation of type, but including *Pupa menkeana* Pfeiffer. E. v. Martens, 1860, Die Heliceen, p. 298, as a subgenus of *Pupa; Pupa menkeana* Pfeiffer designated as type.[2]

These snails have almost universally been called *Ennea*, but they differ from that group (which is herein ranked as a subgenus of *Ptychotrema*) by the structure of the palatal teeth. In *Ennea* there are two long, spirally entering palatal folds, in definite and invariable positions. They are indicated on the back of the last whorl by spiral furrows. In *Gulella* there is no consistent differentiation into upper and lower palatals, the tooth or teeth being variously formed, sometimes entering obliquely a short distance, but never taking the form of long, spirally entering folds. There are no dorsal furrows, though often there are pits behind the peristome.

Kobelt and others have defined a number of named "sections" and, as experience has shown that such divisions are useful in dealing with genera containing a great number of species, several new groups of like character are now proposed.

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[1] Not *Ennea* (*Sphinctotrema*) *joubini* Germain, 1912, Bull. Mus. Hist. Nat. Paris, p. 318; Prince's Island.

[2] Bourguignat named *Pupa capitata* Gould as type in 1889, Moll. Afrique Equat., p. 126, but his action had been anticipated. Kobelt and v. Möllendorff have repeated this error, 1904, Syst. Conchyl. Cab. Enneidæ, p. 179.

PRIMIGULELLA, new section

Rather large, oval *Gulellæ* having many lamellæ and folds on the broadly reflected peristome. The angular lamella is arcuate in basal view, complex, its emerging end elevated; sinulus opening laterally. The neanic whorls are flat and carinate peripherally. The internal axis is large and hollow, nearly or quite closed below. Type: *G. linguifera* (v. Martens).

This easily recognizable group contains the following species, all described as *Enneæ*:

Gulella foliifera (v. Martens) = *Ennea (Gulella) foliifera* E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 176; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 24, Pl. II, fig. 20. Buloa near Tanga, German East Africa.

Gulella grossa (v. Martens) = *Ennea grossa* E. v. MARTENS, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 182; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 23, Pl. II, figs. 17 and 18. Derema and Buloa, German East Africa.

Gulella jombeneënsis (Preston) = *Ennea jombeneënsis* PRESTON, 1913, Proc. Zool. Soc. London, p. 213, Pl. XXXIII, figs. 8 and 8*a*. Jombene Hills and Mt. Meru, British East Africa.

Gulella pilula (Preston) = *Ennea pilula* PRESTON, 1911, Ann. Mag. Nat. Hist., (8) VII, p. 465, Pl. XI, fig. 5. Mt. Kenia, 6000-8000 feet.

Gulella usagarica (Crosse) = *Ennea usagarica* CROSSE, 1886, Journ. de Conchyl., XXXIV, p. 82, Pl. I, figs. 1, 1*a*, and 1*b*. Usagara.

130. **Gulella (Primigulella) linguifera** (v. Martens)

Ennea (Gulella) linguifera E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 176; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 24, Pl. II, fig. 19.

Ennea roccatii POLLONERA, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 538, p. 3 (type locality: eastern slope of Mt. Ruwenzori in the Mobuku Valley at about 2000 m.); 1909, Il Ruwenzori, Parte Scientif., I, p. 181, Pl. XX, fig. 3. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 179.

Semliki Forest: Bukende and Ongenya (type locality not designated; Stuhlmann Coll.); at the western foot of Mt. Ruwenzori (Schubotz Coll.).

Mt. Ruwenzori: western slope in the Lanuri Valley at about 2000 m., in the Butagu Valley at 2200 m., and Kisuki at about 1400 m. Kilo, Lesse, and Beni in the forest gallery along the Semliki River (Bequaert Coll.).

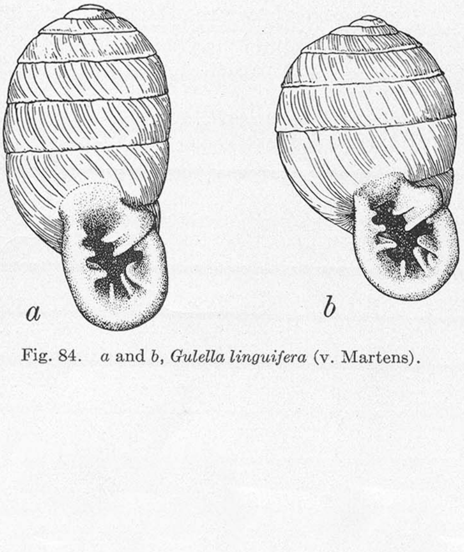

Fig. 84. *a* and *b*, *Gulella linguifera* (v. Martens).

The series of this remarkable species (Fig. 84 *a* and *b*) appears to indicate that the species defined by Pollonera cannot stand, even as a subspecies, since differences greater than those he depends upon occur in some single lots, the individual variations of contour being considerable, while the teeth vary but little. The keel of the early whorls often projects slightly above the suture. The first three measurements are from specimens of one lot.

Length	*Diameter*	*Number of Whorls*	
12.6 mm.	6.7 mm.	7½	Mt. Ruwenzori, 2000 m., Lanuri Valley
11.0	7.0	7⅓	Mt. Ruwenzori, 2000 m.
12.5	6.4	8	Mt. Ruwenzori, 2000 m.
11.0	6.5	7½	Beni
11.5	6.0	8	Lesse

PLICIGULELLA, new section

Shell cylindric-oval, with rounded summit and about 2 smooth embryonic whorls; columellar edge triplicate; angular lamella, a compound palatal tooth and basal teeth well developed. Type: *Gulella bistriplicina*, new species.

This group includes the following species:

Gulella adelpha (Preston) = *Ennea adelpha* PRESTON, 1913, Proc. Zool. Soc. London, p. 199, Pl. XXXII, figs. 7 and 7*a;* Pl. XXXIV, figs. 1 and 1*a*. Between Masaka and Entebbe, S. W. Uganda.

Gulella coarctata (d'Ailly) = *Ennea* (*Gulella*) *coarctata* D'AILLY, 1910, Wiss. Ergebn. Schwed. Zool. Exp. Kilimandjaro Sjöstedt, I, 6, p. 6, Pl. I, figs. 7-9. Mt. Meru and Mt. Kilimanjaro, 3000-3500 m.

Gulella landianiensis (Dautzenberg) = *Ennea landianiensis* DAUTZENBERG, 1908, Journ. de Conchyl., LVI, p. 4, Pl. I, figs. 3 and 4. Landiani (Rift Valley), British East Africa.

Gulella perturbata (Preston) = *Ennea perturbata* PRESTON, 1913, Proc. Zool. Soc. London, p. 199, Pl. XXXV, figs. 7 and 7*a*. Mt. Elgon, Uganda.

Gulella sambourouensis (Dautzenberg) = *Ennea sambourouensis* DAUTZENBERG, 1908, Journ. de Conchyl., LVI, p. 3, Pl. I, figs. 1 and 2. Samburu (inland from Mombasa), British East Africa.

Gulella triplicina (v. Martens).

Gulella vicina (Smith).

Gulella woodhousei (Preston) = *Ennea woodhousei* PRESTON, 1913, Proc. Zool. Soc. London, p. 199, Pl. XXXV, figs. 15 and 15*a*. Mt. Elgon, Uganda.

Probably also:

Gulella copiosa (Preston) = *Ennea copiosa* PRESTON, 1913, Proc. Zool. Soc. London, p. 200, Pl. XXXII, figs. 16 and 16*a*. Urguess, British East Africa.

Gulella optata (Preston) = *Ennea optata* PRESTON, 1911, Ann. Mag. Nat. Hist., (8) VII, p. 464, Pl. XI, fig. 4. Mt. Kenia, 6000-8000 feet.

Gulella papyracea (Preston).

131. **Gulella (Plicigulella) bistriplicina,** new species

Ituri Forest: Penge, type locality; and Avakubi (Bequaert Coll.).

The shell (Fig. 85*a* and *b*) is cylindric with rounded ends, faintly buff whitish, smooth except for fine but conspicuous denticulation below the suture. The summit is rounded, obtuse, of convex whorls; the last three whorls are very weakly convex. The last whorl is a little contracted and striate behind the lip, having a large, deep, rounded pit behind the outer, and a small but sharply impressed one behind the basal lip. The suture is crenulated, and does not ascend to the aperture. The angular lamella is long and high, somewhat curved, the concavity towards the outer lip. There is a much smaller, somewhat immersed oblong parietal lamella. The columella bears a massive lobe, deep within, upon which there are three small, transverse teeth. The outer margin bears a large, bluntly conic median tooth having a tubercle on its upper slope and a small, immersed tubercle just below and weakly joined to its base. There is another similar tubercle below this one. The basal fold is compressed laterally and rather strong. There is a tubercle on the columellar margin, not connected with the columellar lobe within. The peristome is expanded, thickened within, its edge reflected. It is somewhat bent in at the middle of the outer margin, and is arched outward to form a rather distinct sinulus. The twin tubercles in the infrapalatal space are immersed about as deeply as the columellar lobe. In all there are eleven teeth.

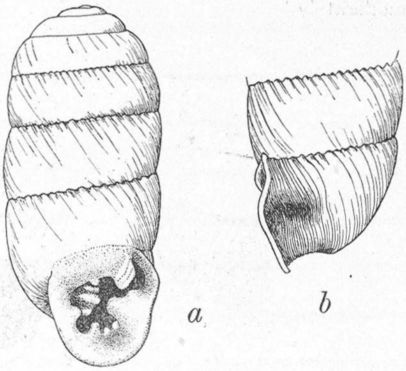

Fig. 85. *a* and *b*, *Gulella bistriplicina*, new species.

Length, 6.5 mm.; diameter, 2.8 mm.; length of aperture, 2.2 mm.; 7 whorls.

This is a smaller species than *Gulella triplicina* (v. Martens) and differs in the details of tooth structure. It is more closely related to *Ennea* (*Gulella*) *vicina* Smith[1] but it is smoother and has an additional tubercle within the columellar margin of the peristome. *Ennea coarctata* d'Ailly, from Kilimanjaro, is a somewhat related but much smaller snail. Other related species are *Ennea perturbata*, *E. woodhousei*, and *E. adelpha* of Preston, all differing in various details of the teeth.

132. **Gulella (Plicigulella) mediafricana,** new species

Beni, in the forest gallery along the Semliki River, type locality, 6 specimens; Lesse in the Semliki Forest, 2 specimens (Bequaert Coll.).

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[1] 1899, Proc. Zool. Soc. London, p. 580, Pl. XXXIII, figs. 1 and 2. Mt. Chiradzulu and Zomba Plateau, south of Lake Nyasa. Smith's reference to *E. triplicaria* v. Martens seems to be an error for *E. triplicina* v. Martens.

The shell (Fig. 86 *a-c*) is shortly cylindric with rounded ends, whitish. First two whorls smooth, the rest having sculpture of slender, nearly straight, oblique riblets, which are rather close on the terminal cone, but become more widely spaced and partly obsolete on the last two whorls which are only weakly convex. The last whorl has strong, regular rib-striation in its last half. There is a broad and rather deep contraction behind the lip, a large pit in it under the palatal tooth, a small one under the basal tooth. The aperture is subquadrangular. The angular lamella is moderately long, its left side thickened and sloping. Parietal lamella oblong, small, somewhat immersed, close to the angular. The columella bears a deeply placed, massive lobe upon which there is a strong, horizontal median lamella and upper and lower lamellæ which are very much smaller and shorter. The palatal lip bears a massive tooth, flat-topped in front view, but emarginate as seen obliquely from the columellar side; on the upper slope of this tooth there is an oblique, downwardly entering upper fold, defining a small sinulus. There are two small, immersed denticles in the infrapalatal space. The rather large basal fold is set a little obliquely. The white lip is broadly expanded, reflected, and somewhat thickened within.

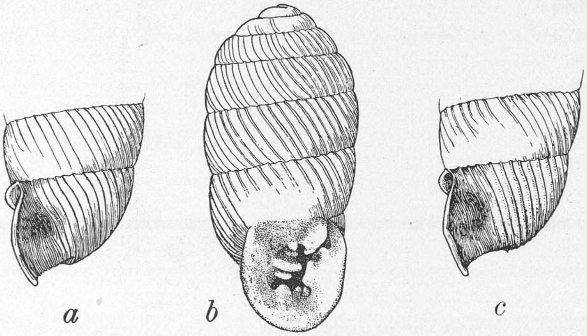

Fig. 86. *a*, *b*, and *c*, *Gulella mediafricana*, new species.

Length, 5.5 mm.; diameter, 2.6 mm.; 6¾ whorls.

This species resembles *Ennea adelpha* Preston, from southwestern Uganda, a closely allied but larger shell with nearly similar teeth. *Ennea subringens* Crosse is like it in shape, but it differs in the teeth of the outer and basal margins of the aperture. The size, external sculpture and details of the teeth separate it from *G. bistriplicina.*

Section GULELLA, proper

133. **Gulella lævigata** (Dohrn)

Ennea lævigata DOHRN, 1865, Proc. Zool. Soc. London, p. 232 (type locality: a small rocky island in Lake Nyasa, named Mumba). E. A. SMITH, 1881, *op. cit.*, p. 281, Pl. XXXII, fig. 6* (between Lake Nyasa and the East Coast). TRYON, 1885, Man. of Conch., (2) I, p. 99, Pl. XIX, fig. 90. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 8. GERMAIN, 1916, Bull. Mus. Hist. Nat. Paris, p. 247.[1]

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[1] In this paper Germain mentions the Congo localities where I collected *E. lævigata* in 1910-11; he adds by mistake the locality Katanga, on the Lufira, 10° S. lat., a place I have never visited. In Dautzenberg and Germain's paper "Katanga" is merely the general region where Bukama is situated [J. B.].

Ennea planidens E. v. Martens, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 179; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 21, Pl. II, fig. 16 (type locality: Bugundi).

Semliki Valley: Bugundi (chief Orani) and Bukende (Stuhlmann Coll.). Lukolela, Vieux Kassongo, Bukama (Bequaert Coll.).

Semliki Forest: Lesse (Bequaert Coll.).

The shell (Fig. 87 *a* and *b*) is cylindric with rounded ends, thin, pale yellow, imperfectly transparent, smooth and glittering, under the lens showing a few impressed lines of growth-arrest. The summit is obtuse, rounded, the whorls convex; first two and one-third whorls forming the embryonic shell. The last three whorls, forming the cylindric portion, are very slightly convex, the suture is simple and does not ascend to the aperture. The last whorl has a large pit behind the outer lip and a little one under the baso-columellar fold. The aperture is rounded-triangular, obstructed by five teeth. Angular lamella rather high, its inner end abruptly bent towards the outer lip. The columellar lamella is strong, horizontal, and is rather remote from the lip-edge. At the junction of the columellar and basal margins there is a compressed tooth. The two subequal palatal plicæ are compressed, horizontal, and stand upon a common eminence. The rimation is somewhat S-shaped.

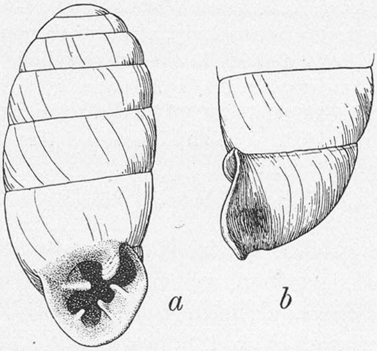

Fig. 87. *a* and *b*, *Gulella lævigata* (Dohrn).

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
9.8 mm.	4.4 mm.	3.2 mm.	7½
10.2	5.0	3.2	7½

This snail is evidently identical with *Ennea planidens* v. Martens and *E. lævigata* Dohrn. The Semliki specimens differ slightly from those compared from Unyika by the somewhat triangular shape of the aperture, caused by the flattening or straightening of the outer lip, which also arches much further forward in a profile view, as shown in the detail figure.

134. **Gulella socialis,** new species

Ituri Forest: Avakubi (Bequaert Coll.).

The shell (Fig. 88*a* and *b*) is cylindric with convexly conic upper third, and obtuse apex; obliquely striate, the striæ slender, rather close on the spire, more spaced on the later whorls, about five in one mm. on the face of the last whorl. The whorls are moderately convex, the last having a deep pit close behind the outer, another much smaller behind the basal, and a third furrow behind the columellar margin of the lip. The suture is impressed, and ascends very shortly to the lip. The angular lamella is high, straight and compressed, its extreme inner end slightly turned towards the outer wall. The columellar lamella is compressed, straight and horizontal. It does not penetrate to the edge of the columella, deep within, which is nearly straight. The outer wall has a larger, compressed lower fold, shortly entering horizontally, and a smaller tubercular fold above it, the two standing upon a common elevation. There is a compressed basal fold. The peristome is thin, expanded. Umbilical crease rather long and straight.

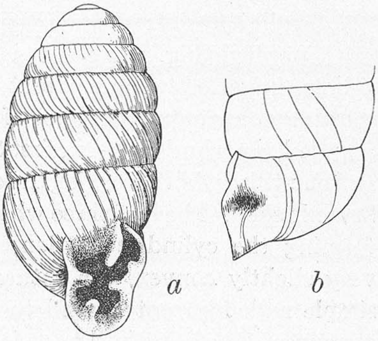

Fig. 88. *a* and *b*, *Gulella socialis*, new species.

Length, 6.8 mm.; diameter, 3.1 mm.; 7 whorls.

This species is represented by one somewhat weathered individual. It is apparently nearest to *Gulella consociata* (Smith), from Kidete (Usagara, German East Africa); but in that the angular lamella is "much curved, hollowed out," not straight as in the present form. The aperture of *consociata* is decidedly wider than in *socialis*.

135. **Gulella sellæ** (Pollonera)

Ennea sellæ Pollonera, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 538, p. 3 (type locality: eastern slope of Mt. Ruwenzori, in the Mobuku Valley at about 2000 m.); 1909, Il Ruwenzori, Parte Scientif., I, p. 181, Pl. xx, fig. 2.

Mt. Ruwenzori: western slope in the Lamia Valley at about 2000 m., 8 specimens (Bequaert Coll.).

The shortest and longest in the series measure: length, 11.3 mm., diameter, 6 mm.; length, 12.7 mm., diameter, 5.8 mm.

The first 2½ whorls are smooth, the following whorls of the cone finely striate; on the cylindric portion the striation weakens and in part disappears. There are pits behind the peristome under the median outer and the basal teeth.

Gulella disseminata (Preston)

Ennea disseminata Preston, 1913, Proc. Zool. Soc. London, p. 202, Pl. xxxiii, figs. 2 and 2*a*.

Near Lake Kivu; also between Lake Mutanda and Lake Kivu (Kemp Coll.; type locality not designated).

136. **Gulella disseminata cymatonotus,** new subspecies

Rutshuru, in the forest gallery of the Rutshuru River, 5 specimens (Bequaert Coll.).

The shell (Fig. 89 *a* and *b*) is cylindric-oblong, the upper fourth convexly conic, apex obtuse. The surface is smooth, with distinct subsutural crenulation, and some striation on the last half of the last whorl. The whorls are moderately convex, the last tapering downward, flattened dorsally, having a strong rounded wave on the right side and base some distance behind the lip, which is preceded by a rather broad contraction, a deep pit behind the middle of the outer margin of the lip, and a quite small one behind the basal. There is also a slight depression behind the above-mentioned wave, in the upper palatal position. The angular lamella enters very deeply and is weakly S-shaped. The columella bears a very strong, subvertical lobe. The outer lip has a massive, broad, median tooth, indistinctly emarginate distally, and entering a little; there is also a vertical callus behind it, difficult to see in the aperture. The basal tooth is rather small, tuberculiform. The lip is thickened and well reflected. Umbilical crevice short and straight.

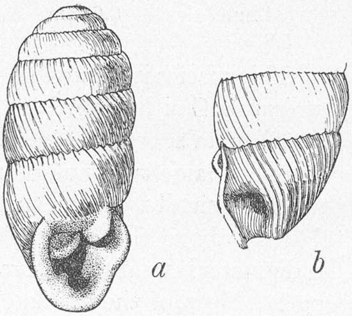

Fig. 89. *a* and *b*, *Gulella disseminata cymatonotus*, new subspecies.

Length, 4 mm.; diameter, 1.8 mm.; 6½ whorls.

This form is closely related to *Ennea disseminata* Preston and *Ennea ingeziensis* Preston. The first of these is described as having "indistinct, oblique costulæ," the second has "obsolete, oblique riblets." The present form has some striation on the last half or third of the last whorl, but elsewhere it is quite smooth except for the subsutural crenulation. The palatal process does not project so far into the aperture as Preston's figures show. It is wider than in the figures of *E. ingeziensis*. Neither of Preston's descriptions mentions the broad swelling or wave on the back, preceding the contraction behind the peristome. It is quite possible that all of these forms are varying manifestations of a single species.

137. **Gulella rutshuruensis,** new species

Rutshuru, in the forest gallery along the Rutshuru River, type locality, 50 specimens; also Walikale, 2 specimens (Bequaert Coll.).

The shell (Fig. 90*a* and *b*) is rimate, cylindric, whitish. The summit is rounded; first 1¾ whorls smooth, those following having very fine, close striæ. On the cylindric part the striation becomes coarser and weak except close to the suture, which is crenulated by sharp striæ; on the last half of the last whorl the striation is fine and well developed. The last whorl is contracted a little behind the peristome, with a broad pit behind the outer lip, narrow ones behind the basal and columellar lips. The aperture is subquadrate; peristome well expanded and reflected, broad. The angular lamella is high, rather long, a little curved, the concavity towards the outer lip. There are two palatal teeth, connected at their bases, the lower one larger. The basal and columellar margins each have one compressed, entering tooth.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
8.4 mm.	3.6 mm.	2.8 mm.	7	Type
5.8	3.4		6¼	Shortest specimen

This species is related to *Ennea fortidentata* Smith, from Mamboya, but differs in several respects. The columellar lamella is not bifurcate; there is no small tooth on the parietal wall, above the columella, and the diameter is smaller relative to the length. Most of the specimens are of the longer form figured, but there are a few connecting these with the shorter one.

According to Smith, 1899, Proc. Zool. Soc. London, p. 581, the specimens of *E. fortidentata* from the Unyika Range lack the minute parietal tooth above the columella.

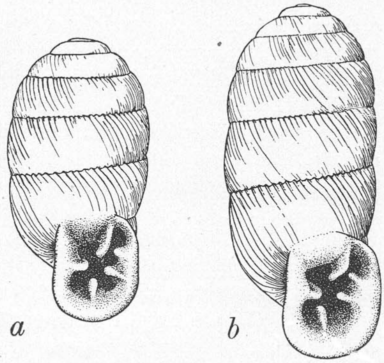

Fig. 90. *a* and *b*, *Gulella rutshuruensis*, new species.

Ennea decussatula Preston, from Kigezi, southwestern Uganda, has some resemblance to this species, and the locality is not far away. It is a larger shell, differing in sculpture, and the columellar lamella ascends inward, while in *rutshuruensis* it is horizontal.

138. **Gulella lessensis,** new species

Semliki Forest: Lesse, 1 specimen (Bequaert Coll.).

The shell (Fig. 91*a* and *b*) is cylindric-oblong, the last three whorls of about equal diameter, those above forming a short, convexly conic summit, the apex obtuse; cartridge buff. The first 1¾ whorls appear smooth, but have delicate microscopic spiral striation. Following whorls are obliquely ribbed, the ribs about one-third as wide as their intervals, which are irregularly wrinkled in spiral direction. There are

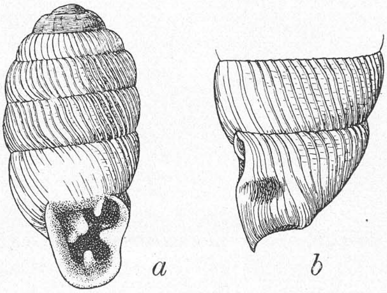

Fig. 91. *a* and *b*, *Gulella lessensis*, new species.

8 or 9 ribs in one millimeter on the ventral face of the penult whorl. On the face of the last whorl the ribs are almost wanting, but they reappear somewhat irregularly on the back and latter half. The whorls are moderately convex, the last tapering downwards, slightly contracted behind the lip, a low wave parallel to the lip preceding the contraction. There is a deep pit in the contraction behind the outer margin and a smaller one at the base. The aperture is somewhat quadrangular. The angular lamella is thin, rather low and not very long, a little curved, the concavity towards the outer lip. The columella has a strong, somewhat immersed subvertical fold bearing two weak nodules. The outer lip has a median, rather massive, round-topped tooth, wide near the lip-edge, tapering wedge-like inward (as viewed from the columellar side); a small callus is seen a short distance beyond its inner edge. The basal tooth is small, receding. The peristome is well expanded, somewhat thickened within; the columellar margin being nearly straight, the outer margin emarginate in the middle. The oblique umbilical crease is rather long and straight.

Length, 4.3 mm.; diameter, 2.2 mm.; 6½ whorls.

With teeth arranged much as in *Ennea œquidentata* Smith, this shell has different sculpture, a bituberculate columellar fold, and smaller dimensions.

Section **PAUCIDENTINA** v. Martens

Paucidentina E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 16 (no type species designated).

Paucidentata PRESTON, 1916, Ann. Mag. Nat. Hist., (8) XVII, p. 260, for *Ennea monodon zairaënsis* Preston (presumably an error for *Paucidentina*).

Oval or cylindric-oblong *Gulellœ* with small teeth, but little obstructing the aperture; angular lamella short, crescentic; a simple palatal nodule or tooth; columellar edge straight or convex, oblique, without teeth, the columellar lip sloping, plain or toothed; embryonic whorls smooth. Type: *E. ovalis* Thiele (=*Ennea curvilamella* v. Martens, in part).

This section appears to be very closely related to *Huttonella* Pfeiffer, type, *Ennea kraussi* Pfeiffer, but in that species there is a tooth on the edge of the columella.[1]

The following species, among others, belong here:

Gulella arthuri (Preston).

Gulella baccata (Preston) =*Ennea baccata* PRESTON, 1913, Proc. Zool. Soc. London, p. 198, Pl. XXXII, figs. 10 and 10*a*. Urguess, British East Africa.

Gulella curvilamella (Smith) =*Ennea curvilamella* E. A. SMITH, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 163, Pl. VI, fig. 8. Mamboya, German East Africa.

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[1] *Ennea kraussi* was designated as type of *Huttonella* by Bourguignat, 1889, Moll. Afr. Equator., p. 126. *Ennea bicolor*, often considered to be the type, appears to belong to the section *Indoennea* Kobelt.

Gulella galactochila (Crosse) = *Ennea galactochila* CROSSE, 1886, Journ. de Conchyl., XXXIV, p. 85, Pl. I, figs. 2, 2*a* and 2*b*. Usagara.

Gulella ovalis (Thiele).

Gulella varians (Smith).

139. **Gulella (Paucidentina) brevis** (Thiele)

Ennea curvilamella Smith. E. v. MARTENS, partly, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 16; the specimens from Migere in Butumbi (not *E. curvilamella* Smith; the specimen from Mt. Ruwenzori is *E. ovalis* Thiele).

Ennea brevis J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 181, Pl. IV, fig. 15 (= *Ennea curvilamella* var. *brevior* v. Martens, label in Berlin Museum, according to Thiele).

Type locality: Migere in Butumbi (Stuhlmann Coll.).

Two specimens from Mukule at about 1800-2000 m. (Bequaert Coll.), are apparently referable to this species, which has been well described by Thiele. They differ, however, by the slightly more triangular shape of the aperture, which appears to be a little narrower below, and by the slightly smaller size: length, 5.8 mm.; diameter, 3.2 mm.; 6½ whorls.

It is closely related to *G. camerani* (Pollonera), but there are no teeth within the columellar margin of *G. brevis*.

140. **Gulella (Paucidentina) camerani** (Pollonera)

Ennea camerani POLLONERA, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 538, p. 3 (type locality: eastern slope of Mt. Ruwenzori at about 2000 m. in the Mobuku Valley); 1909, Il Ruwenzori, Parte Scientif., I, p. 182, Pl. XX, fig. 5.

Mt. Ruwenzori: on the western slope in the Butagu Valley at about 1800, 2000, and 2200 m.; also in the Lamia Valley. It appears to be rather abundant (Bequaert Coll.).

Pollonera, who had two specimens, has excellently described this species, but his otherwise good figure does not show the characteristic sculpture. The 2⅓ nuclear whorls are smooth; those following have very close, fine and regular striation. In some places interrupted spiral striæ may be seen. On the last half of the last whorl, the striæ are a little coarser and more spaced, and below the suture they are emphasized and recurved. The shallow umbilical crease is very short. There is a rounded pit behind the outer lip margin.

The series taken by Bequaert shows considerable variation in the teeth. The typical form has a compressed, obliquely set tooth within the base of the columellar lip, a much smaller, tubercular tooth above it (Fig. 92*b*); but in most of the lots there are evidently adult specimens in which the upper columellar tubercle is very low, or entirely wanting (Fig. 92*a*). Sometimes there is a well-developed basal tooth (Fig. 92*c*), or there may be two to four low tubercles within the basal lip (Fig. 92*d*). The several stages in development of the teeth are well connected by individuals showing intermediate stages, in several of the lots, so that there is no question of specific diversity. It appears to be a variable species within most colonies, though one of the lots, from 2200 m., contains only three-toothed shells, and in the Lamia lot, at 2000 m., all the shells show at least a trace of a basal tooth or teeth.

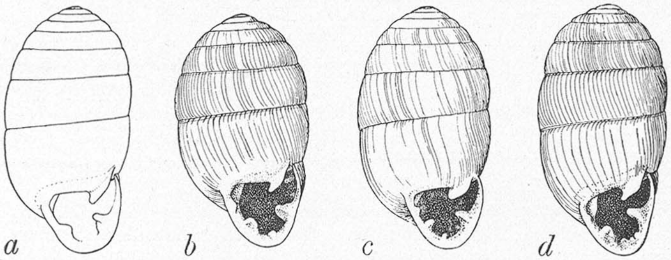

Fig. 92. *a-d, Gulella camerani* (Pollonera).

In the related *Gulella varians* (Smith), similar variability of teeth has been described. Some other *Gulellæ* which I have seen in large numbers show no variation in the number of teeth, and but little in their size or form.

Ennea arthuri Preston[1] appears to be closely related to *camerani*. Preston's statements as to the relative and actual sizes of *E. arthuri* and *E. baccata* are singularly contradictory. Also there appears to be an error in the size of the aperture of the latter species as stated by him.

141. **Gulella (Paucidentina) polloneriana,** new species

Ituri Forest: Avakubi, type locality, and Penge. Also at Mbisi near Masisi and at Mukule, 1800-2000 m. (Bequaert Coll.). Medje (Lang and Chapin Coll.).

The shell (Fig. 93*a* and *b*) is cylindric oblong, with shortly, convexly conic summit, thin, slightly buff, imperfectly transparent, very glossy. The first two whorls are smooth; following whorls are closely striate, with more conspicuously impressed grooves at unequal intervals; the last whorl being almost smooth in front but having rather widely spaced grooves on the last half. There is a small dent behind the outer lip. The whorls are only slightly convex. Suture not deep, having a narrow, gray, retractively plicatulate border. The aperture is rounded triangular. The angular lamella is short, bowed, ascending higher than the outer lip. The columella has a deeply placed, slightly convex fold, and within the columellar lip there are two denticles, the upper one generally smaller, low (often subobsolete), the lower one tuberculiform. The outer lip has a compressed, very shortly entering median tooth. The peristome is narrowly expanded, a little reflected, and both outer and columellar margins arch forward in the middle. The umbilical crease is very short.

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[1] 1913, Proc. Zool. Soc. London, p. 198, Pl. XXXII, figs. 9 and 9*a*. Jombene Hills, British East Africa.

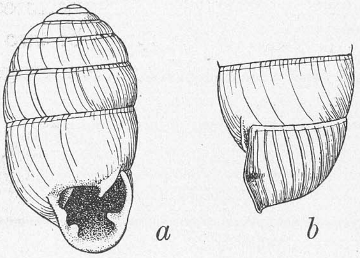

Fig. 93. *a* and *b*, *Gulella polloneriana*, new species.

Length	*Diameter*	*Number of Whorls*	
7.5 mm.	4.0 mm.	7½	Avakubi; type
8.6	4.4	7¾	Penge
7.9	3.9	7½	Penge

This species is closely related to *G. camerani* (Pollonera), differing from that markedly in sculpture, and in the shape of the outer lip-tooth, which is more compressed, the outside marked with a linear impression over it, while in *camerani* there is a much larger rounded pit. *Ennea baccata* Preston appears to be a related but smaller species.

In the specimens from Mukule the columellar tubercles are weaker than in the others, and the upper one is sometimes obsolete. The lower columellar tooth is not so large and pliciform as in *G. camerani*.

142. **Gulella (Paucidentina) masisiensis,** new species

Mbisi near Masisi, 1 specimen (Bequaert Coll.).

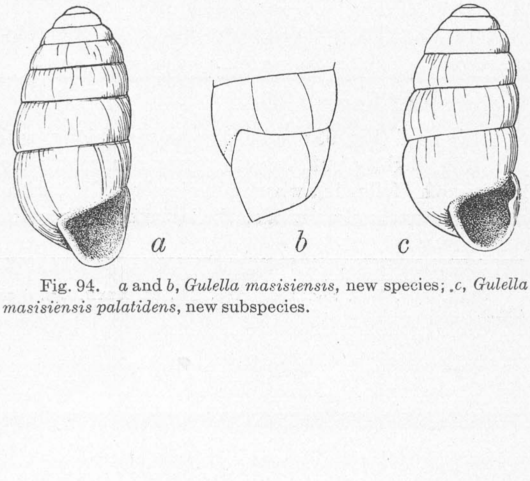

Fig. 94. *a* and *b*, *Gulella masisiensis*, new species; *c*, *Gulella masisiensis palatidens*, new subspecies.

The shell (Fig. 94*a* and *b*) is cylindric, thin, buff, semitransparent, smooth except for a few slight growth-wrinkles at wide intervals, very glossy. The summit is shortly, convexly conic. The upper whorls are somewhat convex, the lower ones nearly flat. Suture slightly impressed and ascending a little in front. The aperture triangular-piriform, without teeth. The outer lip is not expanded or thickened, though there is a smooth, blunt finish. It projects forward, and is most prominent above the middle. The basal margin is deeply arcuate, a little expanded, slightly thickened. The columellar margin is oblique, straightened, the edge dilated above. The columella is short and vertical. The umbilical crease is shallow and very short.

Length, 8 mm.; diameter, 3.5 mm.; 8 whorls.

It resembles *Ennea amicta* Smith, of Mamboya, in the shape and toothless aperture, but the shell is somewhat larger and does not show the sculpture described by Smith. Probably this species and the following, with *G. dohrni* (Smith) and *G. monodon* (Morelet), form a section distinct from *Paucidentina*.

143. **Gulella (Paucidentina) masisiensis palatidens,** new subspecies

Walikale, 1 specimen (Bequaert Coll.).

The shell (Fig. 94*c*) tapers upward slightly more than *G. masisiensis*. The outer lip is somewhat thickened, projects forward more, and has a low tooth within the projection, at the upper third. The shell is bleached and opaque, with the surface somewhat worn, but very weak striation is visible in some places.

Length, 7.5 mm.; diameter, 3.5 mm.; 7¼ whorls.

144. **Gulella (Paucidentina) chapini,** new species

Ituri Forest: Medje, 1 specimen (Lang and Chapin Coll.).

The shell (Fig. 95*a* and *b*) tapers from the last whorl, at first slowly, near the summit rapidly, to the obtuse apex. The surface shows very faint, fine subvertical striæ. The whorls are narrow, slightly convex, joined by a slightly impressed suture, which ascends to the aperture. The aperture is somewhat triangular, without teeth. The blunt outer lip is not expanded or thickened, and projects forward at the upper third. The columellar margin is straightened and expanded. The umbilical crevice is very short, not deep.

Length, 9 mm.; diameter, 3.8 mm.; 8 whorls.

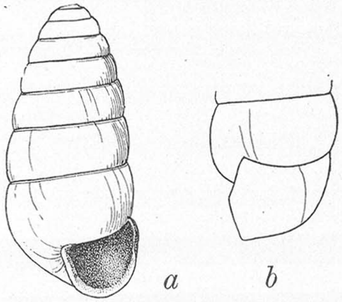

Fig. 95. *a* and *b*, *Gulella chapini*, new species.

This species is closely related to *G. masisiensis*, but the spire tapers much more, the whorls and the aperture are shorter, and it is weakly striate. It tapers far more than *G. amicta* (Smith) and, except that it has no teeth, resembles *G. monodon* (Morelet). The single specimen is bleached.

PUPIGULELLA, new section

Pupiform *Gulellæ* without apertural teeth, the lip well expanded. Type: *Ennea pupa* Thiele.

Gulella (Pupigulella) pupa (Thiele)

Ennea amicta var. *brevior* E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 14. Type locality: Bundeko in the Semliki Valley (Stuhlmann Coll.).

Ennea pupa J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 182, Pl. iv, fig. 20. Type locality: Butumbi (Stuhlmann Coll.).

Since neither the localities or the dimensions agree, the identity of the forms noticed by von Martens and Thiele is not obvious; yet, according to Thiele, he worked with the identical material named by von Martens. Shells collected in the Ituri Forest do not agree fully with the account of *E. pupa*, though they are evidently closely related, and an examination of the type of *E. pupa* may show that it has the characters of the present form.

145. **Gulella (Pupigulella) pupa ituriensis,** new subspecies

Ituri Forest: Penge, type locality (Bequaert Coll.); Medje (Lang and Chapin Coll.).

The shell (Fig. 96) agrees in the main with *Ennea pupa*, but the quite oblique, coarse striæ are enlarged below the suture, forming short folds which crenulate the suture; a feature neither described nor figured by Thiele. The suture ascends to the aperture. The umbilicus is perforate, with a long, curved crease, deeper than usual in "*Ennea*."

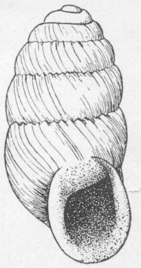

Fig. 96. *Gulella pupa ituriensis*, new subspecies.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
7.5 mm.	3.5 mm.	3.2 mm.	6½	Penge; type
6.2	3.2		6	Penge
5.5	3.2		5½	Medje

SILVIGULELLA, new section

Small, slender *Gulellæ*, tapering from the last whorl to the obtuse apex. About two embryonic whorls are smooth, the rest ribbed; aperture with a strong angular lamella and broad, bifid or emarginate columellar and palatal teeth. Type: *G. osborni*, new species.

Gulella filicosta (Morelet), from Angola, also belongs to this section. So far as I know, there are no other species.

146. **Gulella (Silvigulella) osborni,** new species

Rutshuru, in the forest gallery along the Rutshuru River, 1 specimen (Bequaert Coll.).

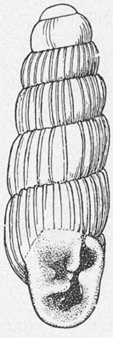

Fig. 97. *Gulella osborni*, new species.

The shell (Fig. 97) is elongate, slowly tapering from the last whorl to the large, rounded summit. The first 1¾ whorls are smooth, except for some faint vertical striation on the second. Subsequent whorls have strong vertical ribs, about 10 in a mm. on the face of the penult whorl, the intervals smooth, but not very glossy. The early whorls are quite strongly convex, the last two or three somewhat flattened. Suture deeply impressed, crenulated by the ribs. The last whorl has a quite shallow pit behind the middle of the outer lip, and is strongly convex at the base. The aperture is somewhat squarish, the outer and columellar margins being straightened and parallel, the basal margin strongly curved. The angular lamella is strong, moderately long, straight and compressed. The columella has a very large, entering lamella, ascending a little as it enters, and emerging to the inner margin of the columellar lip. Its crest is weakly bilobed. Above its outer end there is a nodule connected with the lamella. Below it, at the base of the columella, there is a quite small, shortly entering fold. Within the outer lip there is a stout nodule above the middle, continued downward and inward for a short distance, the whole forming an oblique, bilobed fold. The peristome is thick, and well reflected. The umbilical crevice is short, deep and oblique.

Length, 3 mm.; diameter, 1 mm.; length of aperture, 0.9 mm.; 6⅓ whorls.

This species is related to *Gulella filicosta* (Morelet).[1] It differs by the smaller size, and by having the aperture much more obstructed by the larger teeth. There is, moreover, a small basal fold, not seen in Morelet's species.

G. filicosta has been referred by Bourguignat to his genus *Raffraya*,[2] but this reference appears to me incorrect. The type of *Raffraya* is *R. milne-edwardsi* Bourguignat, an Abyssinian snail in which there appears to be no angular lamella. A small parietal lamella is present in the middle of the very oblique parietal border. The columella is unarmed, but there is a low boss above the middle of the outer lip, on its inner edge. The outer lip arches forward conspicuously. Almost the only feature in common with *filicosta* is the tapering, ribbed shell, which it shares with *Streptostele* also.

COSTIGULELLA, new section

Only the initial half whorl is smooth, the rest being vertically ribbed. The shells are small and compact; the edge of the columella is not toothed, though there are teeth on the columellar and outer lips; the angular lamella is bifurcate anteriorly. Type: *G. langi*, new species.

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[1] *Carychium filicosta* Morelet, 1868, Voy. Welwitsch, Moll. terr. et fluv., p. 84, Pl. III, fig. 3; forest of Quisucula near Bango (Golungo Alto, Angola).

[2] 1883, Ann. Sci. Nat. Zool., (6) XV, p. 67.

The following species belong here:

Gulella adjacens (Preston) = *Ennea adjacens* Preston, 1913, Proc. Zool. Soc. London, p. 214, Pl. xxxii, figs. 8 and 8*a*; between the Jombene Hills and Nyeri, British East Africa.

Gulella mirifica (Preston) = *Ennea mirifica* Preston, 1913, Proc. Zool. Soc. London, p. 214, Pl. xxxiv, figs. 11 and 11*a;* Mt. Nyiro, S. of Lake Rudolf, 8300 feet, British East Africa.

Gulella pretiosa (Preston) = *Ennea pretiosa* Preston, 1911, Ann. Mag. Nat. Hist., (8) VII, p. 465, Pl. xi, fig. 6; between Rumruti and Mt. Kenia, and also on Mt. Kenia at 6000-8000 feet, British East Africa.

Gulella pretiosa nyiroensis (Preston) = *Ennea pretiosa nyiroensis* Preston, 1913, Proc. Zool. Soc. London, p. 214; Mt. Nyiro, British East Africa.

Gulella spatium (Preston) = *Ennea spatium* Preston, 1913, Proc. Zool. Soc. London, p. 214, Pl. xxxv, figs. 12 and 12*a*; Larogi Hills, British East Africa.

147. **Gulella (Costigulella) langi,** new species

Thysville, in a cave, 1 specimen (Lang and Chapin Coll.).

The shell (Fig. 98*d*) is shortly cylindric with extremely obtuse summit, cartridge buff. The first half whorl is nearly smooth, after which the whorls are closely set with vertical riblets much narrower than their intervals. There are between seven and eight riblets in one mm. on the face of the last whorl. In the smooth, glossy intervals between the riblets, there are very fine but distinct spiral threads, very much narrower than their intervals, about 40 between sutures. The last whorl is very deeply contracted behind the peristome, striate but without ribs in the contraction, and somewhat gibbous behind it. The angular lamella is Y-shaped, being shortly biramose in front. The columellar edge, far within, is smooth and vertical but there is a prominent columellar lamella in front of it, emerging to the lip-edge, a small subcolumellar tubercle below it. Near this there is a similar basal tubercle.

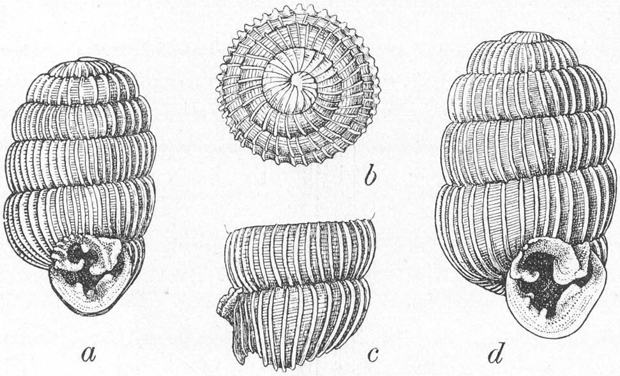

Fig. 98. *a*, *b*, and *c*, *Gulella toticostata*, new species; *d*, *Gulella langi*, new species.

Within the outer lip there is a broadly, obliquely conic tooth, which is more abrupt on its upper, sloping on its lower border. The peristome is well expanded. The umbilical crevice is rather long and nearly straight.

Length, 3.25 mm.; diameter, 2 mm.; fully 5 whorls.

This and the following form are remarkable for the sculpture of the early whorls. They are somewhat like *Ennea adjacens* Preston, a larger species, differing in details of the teeth. *E. spatium* Preston is also larger, with much more widely spaced ribs.

148. **Gulella (Costigulella) toticostata,** new species

Ituri Forest: Penge, 1 specimen (Bequaert Coll.).

Closely related to *G. langi*, gray with white ribs, more closely set than in *G. langi*, about ten in a millimeter on the face of the last whorl, the glossy intervals having microscopic spiral threads as in *G. langi*. The initial half whorl is free from ribs. The last whorl is a little more deeply contracted behind the peristome than in *G. langi*. The angular lamella is shortly biramose in front, and within it is high, thick, its edge bent towards the columella. There is an oblong parietal tubercle. The columellar lamella is strong, thickened and indistinctly bifid at the free edge, emerging to the edge of the peristome. There is a stout, shortly entering lamella within the baso-columellar curve, and a smaller basal tubercle. Within the outer lip there is an obliquely descending, indistinctly bilobed palatal fold. The peristome is expanded. Umbilical crevice rather long and nearly straight (Fig. 98*a-c*).

Length, 2.8 mm.; diameter, 1.7 mm.; 5¾ whorls.

The presence of a strong, tubercular parietal lamella, the somewhat different shapes of the outer teeth, the smaller size and the noticeably closer sculpture, serve to separate this from *G. langi*, which is certainly very nearly related. The localities of the two species are remote.

TORTIGULELLA, new section

Gulellæ with the first two whorls spirally and vertically striate, the following whorls vertically ribbed; angular lamella moderately long; columella with one or two teeth; a sinuous or emarginate, obliquely entering palatal tooth and a basal tooth. Type: *G. heteromphala*, new species.

149. **Gulella (Tortigulella) heteromphala,** new species

Mt. Ruwenzori: western slope in the Butagu Valley at about 2200 m. (Bequaert Coll.).

The shell (Fig. 99*a* and *b*) is thin, perforate, cylindric, the upper third tapering a little convexly to the obtuse apex. First 1¾ whorls are apparently smooth, but spiral lines faintly decussated by growth-lines are visible under the microscope. Subsequent whorls are costulate, the riblets slightly oblique, about one-third as wide as the intervals, about fourteen in one millimeter on the face of the penult whorl, on the last whorl they are vertical and a trifle closer. The last whorl is flattened laterally, broadly contracted behind the lip, where it has a deep, short, spiral furrow below the middle. There is a similar but shallower furrow on the base. The aperture is small. The angular lamella is thin, not very long, its inner end turning slightly towards the outer lip. It is biramose above, a pit between the branches. Very deep within, the columella has a long upper and short lower tooth. The outer lip has a strong, median, somewhat sinuous, entering fold. The basal fold is low but rather long, entering obliquely. There is an ovate umbilicus and a long, arcuate crease, the curvature produced by a swelling on the left wall of the aperture.

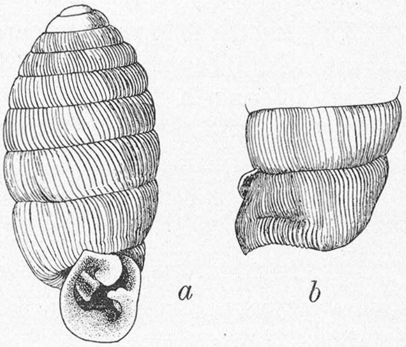

Fig. 99. *a* and *b*, *Gulella heteromphala*, new species.

Length, 3.8 mm.; diameter, 1.8 mm.; length of aperture, 1.1 mm.; 8½ whorls.

I have not found any species closely resembling this. The thinness of the costulate shell, the large number of whorls, long furrows behind the lip and small aperture are its prominent features.

150. **Gulella (Tortigulella) cara,** new species

Mt. Ruwenzori: western slope in the Butagu Valley at about 2200 m. (Bequaert Coll.).

The shell (Fig. 100) is very small, oval, whitish, translucent, the penult whorl widest, those above tapering rapidly to the obtuse apex, the last whorl slightly less in diameter than the penult. The first two whorls are microscopically granular at the intersections of very fine, close, vertical and spiral striæ; following whorls are elegantly costulate, the riblets straight, vertical, about as wide as the intervals, about nine or ten in one millimeter on the face of the last whorl. The last whorl has a deep pit behind the outer lip, and a far smaller one behind the baso-columellar margin. The aperture is widest above, rounded at the base. The angular lamella is large, nearly straight, and does not enter deeply. The columella bears a strong, rounded lobe, somewhat deeply immersed. Within the outer lip there is a large, entering, obliquely descending, emarginate (or obtusely bitubercular) fold. In the curve uniting columellar and basal margins there is a low, oblique basal fold. The peristome is moderately expanded, a little reflected. The umbilical region is somewhat impressed, with a minute perforation terminating the strongly arcuate crevice.

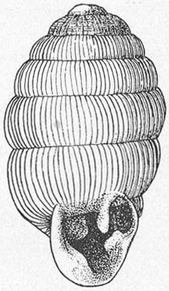

Fig. 100. *Gulella cara*, new species.

Length, 2.7 mm.; diameter, 1.5 mm.; 6⅓ whorls.

Ennea opoboensis Preston, though larger, appears closely related. The sculpture of the summit is similar in *G. heteromphala*, but perhaps it belongs to another section.

CONOGULELLA, new section

Small, conic forms with spirally striate embryonic whorls; aperture with angular and columellar lamellæ, basal and palatal folds. Type: *Ennea conospira* v. Martens.

Gulella (Conogulella) conospira (v. Martens)

Ennea conospira E. v. MARTENS, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 182 (type locality: Buea in Kamerun).

The typical form has not been found in the Belgian Congo.

151. **Gulella (Conogulella) conospira polynematica,** new subspecies

Compare with *Ennea conospira* form *minor* D'AILLY, 1896, Bihang Svenska Vet. Ak. Handl. Stockholm, XXII, 4, No. 2, p. 19, Pl. I, figs. 6-9 (type locality: Kitta in Kamerun).

Ituri Forest: Penge, type locality, and Avakubi (Bequaert Coll.).

The shells from these localities agree very well with d'Ailly's account and his exquisite figures, except in one detail. He shows very few spiral threads on the second and third whorls—about four may be counted in the figure—and in the description the number is not stated. In our form (Fig. 101*a* and *b*) the first half whorl is nearly smooth (though not glossy); spiral threads then appear, with some radial rugosity, and on the last embryonic whorl there are about sixteen well-raised threads on a nearly smooth ground. There are 2½ embryonic whorls. On the face of the last or the penult whorl there are five to six striæ in one millimeter. The teeth do not appear to differ from those of *conospira*.

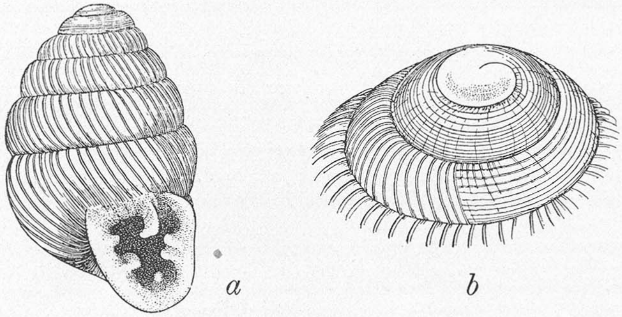

Fig. 101. *a* and *b*, *Gulella conospira polynematica*, new subspecies.

Length, 4.9 mm.; diameter, 3 mm.; 6½ whorls.

AVAKUBIA, new section

Small *Gulellæ* having embryonic whorls spirally striate, aperture with a small but long angular lamella and a palatal tooth; columella simple. Type: *G. avakubiensis*, new species.

152. **Gulella (Avakubia) avakubiensis**, new species

Ituri Forest: Avakubi (Bequaert Coll.).

The shell (Fig. 102) is oval, widest at the penult whorl, gray whitish. The apex is obtuse, first half whorl smooth; the next two whorls are distinctly striate spirally, the striæ thread-like, closely but not strongly beaded, numerous, about fourteen on the last embryonic whorl, separated by wider intervals. The subsequent whorls have strong, oblique ribs, about six or seven in one millimeter on the face of the last or the penult whorl, the intervals having microscopic sculpture of rather coarse, low spiral striæ. The whorls are strongly convex. The last whorl ascends to the aperture and is not contracted behind the lip. The aperture is rounded, truncate above. The angular lamella is thin and low, very long, entering at least a half whorl (as far as can be seen in the aperture). The parietal callus is elevated at the outer termination of the angular lamella. The columella appears concave from in front, but in an oblique view from the right side its edge, far within, is straight and vertical. There is a very small conical tooth within the outer lip, above the middle. A low, transverse fold is visible some distance within the basal margin. The umbilical crease is moderately long and slightly curved. The peristome is broadly expanded.

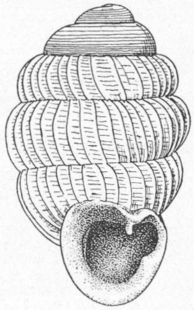

Fig. 102.
Gulella avakubiensis, new species.

Length, 3.25 mm.; diameter, 2 mm.; 5½ whorls.

This species has no close relatives among described forms, so far as I have been able to find. The sculpture, shape, and the very deeply entering angular lamella are characteristic. The single example taken has the edge of the lip chipped. This has been restored in the drawing.

Other Species of *Gulella* Recorded from the Belgian Congo

Gulella burungaensis (Preston)

Ennea burungaensis PRESTON, 1913, Proc. Zool. Soc. London, p. 206, Pl. XXXII, figs. 12 and 12*a*.

Type locality: Burunga at the foot of Mt. Mikeno, 6000 feet (Kemp Coll.).

Gulella coarti (Dautzenberg and Germain)

Ennea coarti DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 10, Pl. III, figs. 1 and 2.

Type locality: Lukonzolwa (Bequaert Coll.).

Gulella excavata (v. Martens)

Ennea excavata E. v. MARTENS, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 178; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 19, Pl. II, fig. 14.

Type locality: Butumbi (Stuhlmann Coll.).

Gulella exogonia (v. Martens)

Ennea (*Uniplicaria*) *exogonia* E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 175; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 15, Pl. II, fig. 10. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 180, figs. v and vi; Pl. IV, fig. 13.

Type locality: Mt. Ruwenzori: western slope in the Butagu Valley, forest region at 2600 m. (Stuhlmann Coll.); also found in the Butagu Valley by Schubotz.

The following is a synonym of *exogonia* according to Thiele: *Ennea aloysii-sabaudiæ* POLLONERA, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 564, p. 1; 1909, Il Ruwenzori, Parte Scientif., I, p. 182, Pl. XX, fig. 4. Type locality: western slope of Mt. Ruwenzori, in the valley between Mt. Baker and Mt. Stanley (*Valle dei Laghi*, which is the upper part of the Butagu Valley, at about 4400 m.; J. B.).

Gulella fortidentata (Smith)

Ennea (*Gulella*) *fortidentata* E. A. SMITH, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 162, Pl. VI, fig. 6 (type locality: Mamboya in Usagara, German East Africa, 4000-5000 feet). E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 21.

In the Semliki Valley: Bukende and Bundeko (Stuhlmann Coll.).

Gulella haullevillei (Dautzenberg and Germain)

Ennea haullevillei DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afr., IV, p. 9, Pl. III, fig. 13.

Kundelungu Plateau at about 2000 m. (between Sampwe and Kilwa); also Kalassa on the Luapula River (Bequaert Coll.); type locality not designated.

Gulella iridescens (Preston)

Ennea iridescens PRESTON, 1913, Proc. Zool. Soc. London, p. 205, Pl. XXXIII, figs. 12 and 12*a*. Type locality: near Kigezi, extreme S. W. Uganda.

Gulella iridescens curta (Preston)

Ennea iridescens var. *curta* PRESTON, 1913, *op. cit.*, p. 206.

Type locality: Burunga at the foot of Mt. Mikeno, 6000 feet (Kemp Coll.).

Gulella lamyi (Dautzenberg and Germain)

Ennea lamyi DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 6, Pl. II, figs. 9-11.

Type locality: Lukonzolwa (Bequaert Coll.).

Gulella mikenoensis (Preston)

Ennea mikenoensis PRESTON, 1913, Proc. Zool. Soc. London, p. 209, Pl. XXXIV, figs. 10 and 10*a*.

Type locality: Burunga at the foot of Mt. Mikeno, 6000 feet (Kemp Coll.).

Gulella ovalis (Thiele)

Ennea (*Paucidentina*) *curvilamella* Smith. E. v. Martens, partly, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 16, Pl. II, fig. 9; the specimen from Mt. Ruwenzori, 3100 m. (not *E. curvilamella* Smith; the specimens from Migere are *E. brevis* Thiele).

Ennea ovalis J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 179, Pl. IV, fig. 14.

Type locality: Mt. Ruwenzori, western slope in the Butagu Valley at 3100 m. (Stuhlmann Coll.).

Gulella papyracea (Preston)

Ennea papyracea Preston, 1913, Proc. Zool. Soc. London, p. 212, Pl. XXXV, figs. 4 and 4*a*.

Type locality: Near Lake Kivu, Belgian Congo (Kemp Coll.).

Gulella triplicina (v. Martens)

Ennea (*Gulella*) *triplicina* E. v. Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 176; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 22, Pl. II, fig. 22.

Semliki Valley: Bugundi (type locality) and Bukende (Stuhlmann Coll.).

"*Ennea*" *mutandaensis* Preston

Ennea mutandaensis Preston, 1913, Proc. Zool. Soc. London, p. 211, Pl. XXXIV, figs. 13 and 13*a*.

Type locality: between Lake Mutanda and Lake Kivu (Kemp Coll.).

The figure looks like a *Truncatellina;* I have not seen the shell.

The following species have been found close to the border of the Belgian Congo:

Gulella decussatula (Preston) = *Ennea decussatula* Preston, 1913, Proc. Zool. Soc. London, p. 201, Pl. XXXIII, figs. 1 and 1*a*. Type locality: Kigezi, extreme S. W. Uganda, at about 7000 feet.

Gulella ingeziensis (Preston) = *Ennea ingeziensis* Preston, 1913, Proc. Zool. Soc. London, p. 204, Pl. XXXIII, figs. 9 and 9*a*. Ingezi in the Ufumbiro Mountains (Mfumburu), extreme S. W. Uganda; also from Kigezi in the same region at 6000 feet; var. *pusilla* Preston, 1913, *op. cit.* p. 204, between Mbarara and Kigezi; var. *mbararensis* Preston, 1913, *op. cit.*, p. 205, between Mbarara and Masaka.

Gulella kigeziensis (Preston) = *Ennea kigeziensis* Preston, 1913, Proc. Zool. Soc. London, p. 207, Pl. XXXIV, figs. 2 and 2*a*. Type locality: Kigezi, extreme S. W. Uganda.

Zonitidæ

Aulacopoda having a spiral shell, wholly or in part external, lodging at least part of the viscera and covering the lung. The visceral cavity does not extend into the foot back of the aperture of shell and mantle. Central and lateral teeth of the radula having quadrate basal plates, the marginal teeth aculeate. The sole is tripartite.

The Zonitidæ of tropical and South Africa are related to those of the Oriental Region but, in great part, they are generically distinct. It cannot be said positively that any genus except *Kaliella* is common to the Ethiopian and Oriental regions; but, as yet, very few African species have been dissected. I do not know where to place *Thapsia*, as the published anatomical data are not satisfactory and the few small specimens preserved in alcohol are too much hardened and contracted for dissection.

What I have seen of the soft anatomy gives some reason for thinking it possible that the Peltatinæ, the Ledoulxiinæ, the Helixarioninæ, and the Urocyclidæ are adaptive modifications of a single original stock, rather than derived from several Oriental stocks. They seem to have a common heritage in the capabilities and limitations of specialized lines as well as in their common structures. If this is the case, then the resemblance of the African *Helixarions* to those of the East Indies and Australia is due to convergent evolution. I have not been able to go into this question fully enough to offer more than a suggestion, but in the limited investigation I have been impressed with the individuality of the African assemblage.

THAPSIA Albers

Thapsia ALBERS, 1860, in v. Martens, Die Heliceen, p. 56; *Helix troglodytes* Morelet designated as type (as a subgenus of *Nanina* Gray). PFEFFER, 1883, Abh. Nat. Ver. Hamburg, VII, p. 19 (soft anatomy).

Thapsiella GUDE, 1911, Proc. Malacol. Soc. London, IX, p. 272. Type: *Thapsia masukuensis* Smith; not *Thapsiella* Fischer, 1884.

Gudeëlla PRESTON, 1913, Proc. Malacol. Soc. London, X, p. 285; substitute for *Thapsiella* Gude.

Thapsiella was separated from *Thapsia* on account of the sculpture, which is "finely striated transversely and covered with dense, microscopic spirals," but "devoid of decussation characterizing that genus" (*Thapsia*). There appears to be little difference in some species; and, unless anatomical characters are found to confirm the separation, I would not consider the groups generically distinct

Like the European *Politæ*, the species are difficult. When the soft anatomy comes to be studied, no doubt the results will be more satisfactory.

153. **Thapsia zambiensis**, new species

Zambi, abundant (Lang and Chapin Coll.).

The shell (Fig. 103*a-c*) is depressed, the altitude slightly more than half the diameter, thin, honey-yellow above, paler in the middle of the base, glossy. The spire is very low conic. The first two whorls are smooth; later and last whorls have a microscopic sculpture of fine, uneven striæ in the direction of growth-lines, cut by impressed spiral lines, giving the surface somewhat the texture of a woven fabric. The base has very low, broad growth-wrinkles densely covered with waved superficial spirals. The whorls increase rather slowly to the last, which is disproportionately wide. The suture is not much impressed, and has a narrow gray margin below. The periphery is equably rounded, the base convex, impressed around the small umbilicus. The aperture is rather deeply lunate. The columellar margin of the peristome has a small, triangular dilation at its insertion, not at all covering the umbilicus.

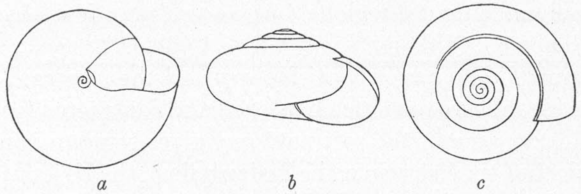

Fig. 103. *a*, *b*, and *c*, *Thapsia zambiensis*, new species.

Altitude, 7.5 mm.; diameter, 13.2 mm.; diameter of umbilicus measured to end of columellar lip, 1.4 mm.; transverse to that, 1 mm.; 5⅔ whorls.

This species differs from *T. indecorata* (Gould) by the more depressed shape and wider last whorl. The aperture, also, is narrower than in Pfeiffer's figures of *indecorata*, and the shell is larger. The sculpture described above is very minute.

154. **Thapsia stanleyvillensis,** new species

Stanleyville, type locality, very abundant (Lang and Chapin Coll.); Thysville, in a cave (Lang and Chapin, and Bequaert Coll.).

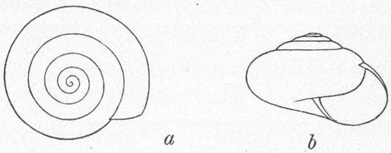

Fig. 104. *a* and *b*, *Thapsia stanleyvillensis*, new species.

The shell (Fig. 104*a* and *b*) is very narrowly umbilicate, depressed with low-conic spire and rounded periphery; transparent ecru-olive; glittering. The whorls are somewhat convex, and increase slowly and regularly. The suture is moderately impressed, and has a very narrow grayish border below. The first whorl appears to be smooth; subsequent whorls are very indistinctly plicate below the suture, with a microscopic sculpture of extremely close, fine, clearly engraved spiral lines, on the base a little weaker than above. The aperture is regularly lunate. Columellar margin dilated near the insertion.

Altitude, 4.4 mm.; diameter, 6.5 mm.; width of umbilicus, 0.4 mm.; 5 whorls.

This species may possibly be what C. Bœttger reported as *T. indecorata* (Gould) from Netona on the Banana Creek.[1] It is apparently not the species from Landana figured as *Helix indecorata* Gould by Morelet,[1] as those figures represent a decidedly larger shell with the last whorl wider relative to the penult whorl than in *stanleyvillensis*. *T. indecorata* (Gould), of Liberia, is a much larger shell than *T. stanleyvillensis* but there does not appear to be much difference otherwise, so far as the published account goes. The size varies but little in the long series of *T. stanleyvillensis* seen, none reaching the dimension of *indecorata*.

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[1] 1913, Ann. Soc. Malacol. Belgique, XLVII (1912), p. 93.

155. **Thapsia rutshuruensis,** new species

Rutshuru (Bequaert Coll.).

The shell (Fig. 105 *a-c*) is much depressed with nearly flat spire, perforate, yellowish, glossy. The first whorl is rather large and projects a little, the next whorl being narrower. All of the post-embryonic whorls are flattened and very slightly concave below the suture. The last whorl is wide, rounded peripherally. There is very slight and superficial microscopic spiral striation near the end of the last whorl above, and around the umbilicus, but it is seen with difficulty, and elsewhere is wanting. There are also weak, fine radial growth-lines. The aperture is deeply lunate. The columellar margin is only narrowly expanded.

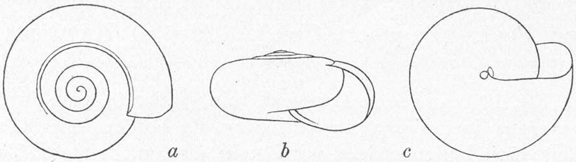

Fig. 105. *a*, *b*, and *c*, *Thapsia rutshuruensis*, new species.

Altitude, 3.3 mm.; diameter, 7 mm.; 4 whorls.

With the exception of *T. hanningtoni stuhlmanni* v. Martens, this species is more depressed than any described from the region. The depression below the suture and the almost entire absence of spiral striation further distinguish it.

T. hanningtoni var. *stuhlmanni* v. Martens is a little flatter, with a half whorl more, the diameter being the same. In the absence of a figure of the shell, a critical comparison is not possible.

156. **Thapsia pompholyx,** new species

Ituri Forest: Penge (Bequaert Coll.).

The shell (Fig. 106*a* and *b*) is depressed globose, perforate, thin, faintly yellowish, subtransparent, glossy. The spire is very low, conic. Sculpture of close, minute, engraved spirals, beginning about the middle of the first whorl, and continuing over the base. The whorls increase slowly to the last, which is more than twice as wide as the penult. The aperture is broadly lunate, the columellar lip dilated at the insertion.

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[1] 1885, Journ. de Conchyl., XXXIII, p. 20, Pl. II, figs. 6, 6*a*, and 6*b*.

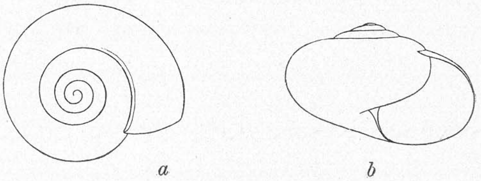

Fig. 106. *a* and *b*, *Thapsia pompholyx*, new species.

Altitude, 5.4 mm.; diameter, 8.4 mm.; 4⅓ whorls.

The unusually globose form and narrow spire relative to the diameter are the chief features of this species.

157. **Thapsia cinnamomeozonata**, new species

Ituri Forest: Medje, type locality (Lang and Chapin Coll.); Avakubi and Penge (Bequaert Coll.). Also at Rutshuru (Bequaert Coll.).

The shell (Fig. 107*a* and *b*) is depressed, thin, perforate, pale olive-buff with a wide cinnamon zone just above the periphery, its borders not sharply defined. Sculpture of fine, close but superficial spiral striæ, also on the base. The whorls are weakly convex, the last rounded peripherally. Aperture lunate. Columellar lip dilated, reflected, and infringing on the narrow perforation. In the largest examples the dilation is slightly sinuous, as figured for *T. rufescens*.

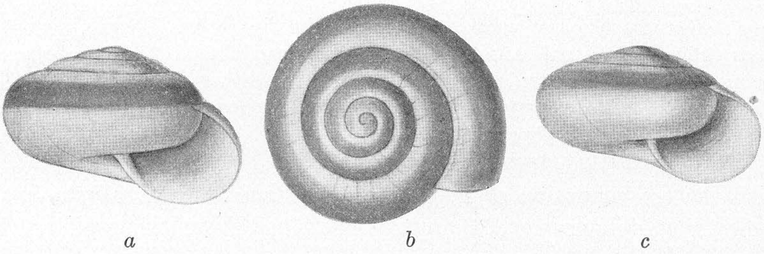

Fig. 107. *a* and *b*, *Thapsia cinnamomeozonata*, new species; *c*, *Thapsia cinnamomeozonata* var. *semlikiensis*, new variety.

Altitude, 3.3 mm.; diameter, 5.5 mm.; width of perforation, 0.35 mm.; 4½ whorls.

While this species resembles *Gudeëlla masakaënsis*, *G. tribulationis*, and some other species described by Preston,[1] yet it has characters not exactly agreeing with any of them. It must be admitted that the identification of species in this group is difficult and uncertain, without direct comparison of specimens. Some of the specimens from Medje and Penge are paler, without a dark band.

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[1] 1914, Proc. Zool. Soc. London, pp. 789-795.

I thought for a time that this species was the unfigured *Thapsia hanningtoni* Smith; the variety *fasciata* v. Martens has the same coloration; yet, from the description one gathers that the umbilicus of Smith's species is larger and the spire higher than in *T. cinnamomeozonata*. Moreover, by publishing a description and accurate figures, a comparison can be made by those having access to the types of *hanningtoni* and *zonata*, which have not been figured.

A form from Moho near Lesse, in the Semliki Forest (Bequaert Coll.), having the aperture distinctly narrower, may be called var. **semlikiensis** (Fig. 107*c*).

158. **Thapsia eucosmia**, new species

Ituri Forest: Medje (Lang and Chapin Coll.).

The shell (Fig. 108*a* and *b*) is very narrowly umbilicate, depressed, indistinctly subangular at the periphery. The spire is very low conoid. The surface is glossy, pale yellow with a cinnamon-brown or hazel zone above the periphery. The first half whorl is smooth; following whorls closely engraved with spiral lines, which become more spaced on the third whorl, are restricted to the vicinity of the suture on the penult, and disappear on the last whorl. The whorls are but weakly convex, the last rounded subangular at the periphery, convex beneath. The aperture is lunate, the columellar lip triangularly dilated at the insertion, as usual. Umbilical perforation very small.

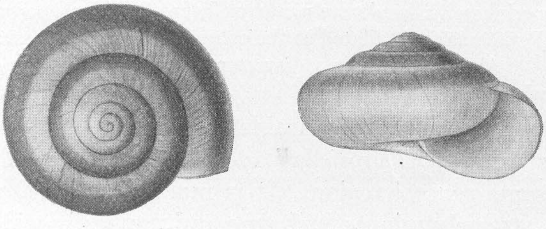

Fig. 108. *a* and *b*, *Thapsia eucosmia*, new species.

Altitude, 5.3 mm.; diameter, 9.5 mm.; 5⅓ whorls.

The coloration is characteristic of this form.

159. **Thapsia consobrina** (Preston)

Gudeëlla consobrina Preston, 1914, Proc. Zool. Soc. London, p. 794, Pl. iii, fig. 9.

Type locality: Mukanda, near Lake Kivu (Kemp Coll.); this might be in the Belgian Congo.

Rutshuru, in the forest gallery along the Rutshuru River (Bequaert Coll.).

Faint traces of spiral striæ may be seen under the microscope in some places. The last whorl is between cream color and warm buff, the inner whorls cinnamon, in the best preserved specimen, which measures: altitude, 5.5 mm.; diameter, 9.4 mm.; with 5 whorls.

Gudeëlla kigeziensis Preston appears to be a rather similar species.

160. **Thapsia mukulensis,** new species

Mukule, at 1800-2000 m. (Bequaert Coll.).

The shell (Fig. 109*a-c*) is perforate, much depressed, the spire but slightly raised; glossy; honey-yellow, imperfectly transparent. The first two whorls are smooth, the rest having microscopic sculpture of close, superficial, granulous, spiral striæ. This sculpture is also beautifully developed upon the base. The whorls are weakly convex, the last one at least twice as wide as the penult, viewed from above, rounded peripherally, moderately convex beneath. The aperture is rather broadly lunate. Peristome thin, dilated at the columellar insertion, as usual.

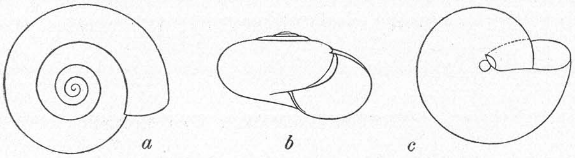

Fig. 109. *a, b,* and *c, Thapsia mukulensis,* new species.

Altitude, 4.8 mm.; diameter, 8.9 mm.; diameter of perforation, 0.5 mm.; 4½ whorls.

I have not been able to identify this with any of the numerous species of "*Thapsiella*" and "*Gudeëlla*" described by Preston from the same general region. It is much depressed, with a beautiful though extremely minute sculpture and unusually wide last whorl.

161. **Thapsia rufescens,** new species

Ituri Forest: Penge, type locality. Also Rutshuru (Bequaert Coll.).

The shell (Fig. 110*a-c*) is small, narrowly umbilicate, depressed, with low conic spire, russet, fading to whitish in the middle of the base, and at the apex. The

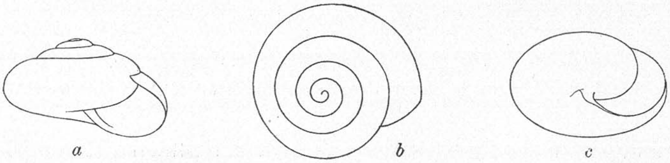

Fig. 110. *a, b,* and *c, Thapsia rufescens,* new species.

surface is glossy. First half whorl or less smooth, the next whorl having dense sculpture of granulous microscopic spiral striæ; following whorls have engraved spiral lines, narrower than their intervals, and equally well developed on the base. The whorls are moderately convex and increase regularly and slowly; the last whorl rounded peripherally. The aperture is obliquely lunate, wide. The columellar margin is dilated and slightly auriculate near the insertion.

Altitude, 2.2 mm.; diameter, 4 mm.; width of umbilicus, 0.2 mm.; 4⅓ whorls.

This is a wider shell with wider aperture than "*Thapsiella*" *opposita* Preston. The russet color and well-developed sculpture, as well as the shape of the columellar margin of the lip, are characteristic features.

Other Species of *Thapsia* Recorded from the Belgian Congo

Thapsia curvatula v. Martens

Thapsia curvatula E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 41, Pl. III, fig. 12 (various localities in German East Africa; type locality not designated). POLLONERA, 1909, Il Ruwenzori, Parte Scientif., I, p. 194. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 199.

Fifty kilometers east of Kasongo (Grauer Coll.). Also recorded from the eastern slope of Mt. Ruwenzori, in the Mobuku Valley at 2000 m

Thapsia gereti Preston

Thapsia gereti PRESTON, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 58, Pl. IV, fig. 2.

Type locality: Maringo Plateaux, Belgian Congo (Collector ?); this may be the Marungu Plateau, west of Lake Tanganyika.

Thapsia hanningtoni (Smith)

Hyalinia hanningtoni E. A. SMITH, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 151 (type locality: Mamboya in Usagara, German East Africa, 4000-5000 feet).

Thapsia hanningtoni Smith. E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 41.

Mt. Ruwenzori: western slope in the Butagu Valley, at 2600 m. in the forest region; also at 3100 m.; Semliki Valley: Karevia and Bundeko, 750 m. (Stuhlmann Coll.).

Thapsia hanningtoni var. *fasciata* v. Martens

Thapsia hanningtoni var. *fasciata* E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 42.

In the forest at the crossing of the Ituri River (region of Kilo); probably also young shells from Massiba on the western slope of the Lendu Plateau; also from Manyonyo on the Murchison Bay of Lake Victoria Nyanza (Stuhlmann Coll.); type locality not designated.

Thapsia hanningtoni var. *stuhlmanni* v. Martens

Thapsia hanningtoni var. *stuhlmanni* E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 42, Pl. I, fig. 7.

Butumbi and Karevia at the western foot of Mt. Ruwenzori (Stuhlmann Coll.); also from the Island Kome on the southern shore of Lake Victoria Nyanza; type locality not designated.

Thapsia inclinans (Preston)

Gudeëlla inclinans Preston, 1914, Proc. Zool. Soc London, p. 792, Pl. iii, figs. 1 and 8.
Type locality: Burunga at the foot of Mt. Mikeno, 6000 feet (Kemp Coll.).

Thapsia indecorata (Gould)

Helix indecorata Gould, 1850, Proc. Boston Soc. Nat. Hist., III, p. 194 (type locality: Liberia). A. Morelet, 1885, Journ. de Conchyl., XXXIII, p. 20, Pl. ii, figs. 6 and 6*a*-*b* (Landana).

Thapsia indecorata Gould. C. R. Bœttger, 1913, Ann. Soc. Malacol. Belgique, XLVII, (1912), p. 93.

Netona on the Banana Creek (Hesse Coll.).

Whether the forms reported by Morelet and C. Bœttger are identical with *Helix indecorata* Gould is somewhat doubtful.

Thapsia inflata (Preston)

Gudeëlla inflata Preston, 1914, Proc. Zool. Soc. London, p. 792, Pl. iii, fig. 21.
Type locality: Burunga at the foot of Mt. Mikeno, 6000 feet (Kemp Coll.).

Thapsia iridescens (Preston)

Gudeëlla iridescens Preston, 1914, Proc. Zool. Soc. London, p. 793, Pl. iii, fig. 15.
Type locality: Mt. Mikeno (Kemp Coll.).

Thapsia multistriata (Preston)

Gudeëlla multistriata Preston, 1914, Proc. Zool. Soc. London, p. 794, Pl. iii, fig. 3.
Type locality: Buhamba near Lake Kivu (Kemp Coll.).

Thapsia simulata Smith

Thapsia simulata E. A. Smith, 1899, Proc. Zool. Soc. London, p. 583, Pl. xxxiii, figs. 21, 22, and 23 (type locality: Mt. Chiradzulu, Nyasaland). Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 16.

Elisabethville, Sampwe,[1] Kikondja (Bequaert Coll.).

The following species probably occur within the boundaries of the Belgian Congo:

Thapsia depressior (Smith) E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 42, Pl. iii, fig. 8 (Migere in Butumbi; Stuhlmann Coll.) = *Hyalinia depressior* E. A. Smith, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 151 (type locality: Mamboya in Usagara, German East Africa, 4000-5000 feet).

Thapsia insimulans E. A. Smith, 1899, Proc. Zool. Soc. London, p. 583, Pl. xxxiii, figs. 16-18 (type locality: Mt. Chiradzulu, Nyasaland). Germain, 1908, in A. Chevalier, L'Afrique Centrale Française, p. 472, records it from Krebedje (= Fort Sibut) and Tete (basin of the Chari River).

Thapsia kigeziensis (Preston) = *Gudeëlla kigeziensis* Preston, 1913, Proc. Malacol. Soc. London, X, 4, p. 285, fig. Type locality: Kigezi in the extreme S. W. Uganda, 6000 feet.

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[1] Mufungwa is another name for the same locality.

Thapsia millestriata (Preston) = *Thapsiella millestriata* PRESTON, 1912, Proc. Zool. Soc. London, p. 186, Pl. XXXII, fig. 12. Type locality: near Kigezi, extreme S. W. Uganda, 6000 feet.

Thapsia mukandaensis (Preston) = *Gudeëlla mukandaensis* PRESTON, 1914, Proc. Zool. Soc. London, p. 794, Pl. III, fig. 11. Type locality: Mukanda near Lake Kivu (this might be in the Belgian Congo); and var. *mutandana* PRESTON, 1914, *op. cit.*, p. 794, Pl. III, fig. 12. Lake Mutanda, S. W. Uganda.

Ledoulxiinæ, new subfamily

The shell is well developed, capable of containing the soft parts, not covered by shell-lobes of the mantle; tail having a horn over the caudal pore; genitalia without dart sac or distinct vagina, the penis surmounted by a group of glands; epiphallus bearing a lime gland and a minute flagellum, as in Helixarioninæ.

LEDOULXIA Bourguignat

Martensia SEMPER, 1870 (?), Reisen im Archipel der Philippinen, (2) III, p. 42, for *Martensia mossambicensis* = *Helix mozambicensis* Pfeiffer. Not *Martensia* Agassiz, 1860.

Ledoulxia BOURGUIGNAT, 1885, Helixarionidées des Rég. orient. de l'Afrique, p. 12; no type designated. IREDALE, 1914, Proc. Malacol. Soc. London, XI, p. 120; list of species; *Ledoulxia albopicta* (v. Martens) = *Helix mozambicensis* var. *albopicta* (v. Martens) selected as type.

?*Falloonella* PRESTON, 1914, Proc. Zool. Soc. London, p. 809. Type: *F. exquisita* Preston.

Ledoulxia, or *Martensia* as it has been generally known, does not appear to be abundant in the Congo Basin; being chiefly an East African, as *Trochozonites* is a West African group. At least part of the *Ledoulxiæ* appear adapted to dry or savannah country, though some occur within the eastern borders of the Rain Forest.

The sculpture pattern of very fine, close, clearly cut, oblique striation on the upper surface of the shell, while the base is smoother and more or less striate spirally, differentiates *Ledoulxia* from *Trochozonites*, which has various other sculpture-patterns; both genera have the shells keeled peripherally.

L. mesogœa and *L. lessensis*, which I have dissected, enlarge our knowledge of the genus somewhat. The caudal horn is long, slightly over 3 mm. in the preserved specimen of *L. mesogœa*, somewhat as in the South African *Kerkophorus*. The tail is narrow and rounded above (Fig. 111*d*). The foot is otherwise as in Helixarioninæ.

The penis of *L. mesogœa* (Fig. 111*b*) is large and short, of an oval shape, with a large cavity having papillose-plicate walls. At its summit there is a large sac or sheath, enveloping the slender basal portion of the epiphallus. When opened, this sheath is seen to contain a number of long, irregular penial glands, adhering to its thin wall. These are

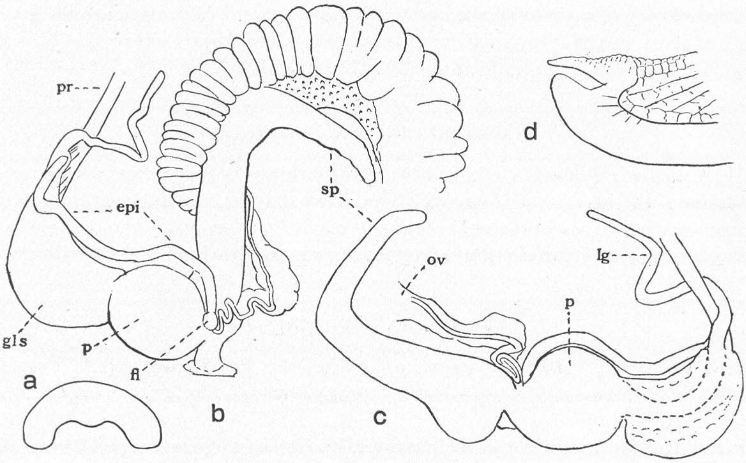

Fig. 111. *Ledoulxia mesogœa* (v. Martens): *a*, jaw; *b* and *c*, genitalia. epi, epiphallus; fl, flagellum; gls, gland sac; lg, lime gland; ov, ovary; p, penis; pr, penial retractor; sp, spermatheca; *d*, tail.

doubtless homologous with the group of "acinöse Anhangsdrüse" figured by Semper for *Ledoulxia mozambicensis.*

The penial retractor is inserted upon the epiphallus at the point of its exit from the gland sac; also a long lime gland. The flagellum is a small, subglobular, calciferous body, as in many Urocyclidæ.

The spermatheca tapers from the base of the duct to the obtuse extremity. There is a lateral swelling on one side of the base. This, like the rest of the lower half, has muscular walls, internally plicate, and a large cavity. The lower part of the oviduct has yellow, glandular walls. In *L. lessensis* (Fig. 114) the penial glands form a lateral sac, not enclosing the epiphallus.

The lung is maculate with gray, showing distinct venation, and is about three times the length of the kidney. The kidney is narrow, twice as long as the pericardium. A line of black flecks marks the reflexed ureter.

The group of penial glands, either free, as described by Semper, or enclosed in a common envelope, as in *L. mesogœa* and *L. lessensis,* is the most notable feature of the genus.

162. **Ledoulxia mozambicensis** (Pfeiffer)

Plate X, Figures 2 and 3

Helix mozambicensis PFEIFFER, 1855, Proc. Zool. Soc. London, p. 91, Pl. XXXI, fig. 1. Type locality: Tete, Mozambique.

Martensia mossambicensis Pfeiffer. SEMPER, 1870 (?), Reisen im Archipel der Philippinen, (2) III, p. 42 (soft anatomy).

Martensia mozambicensis Pfeiffer. GODWIN-AUSTEN, 1895, Proc. Malacol. Soc. London, I, p. 281, Pl. XIX, fig. 1 (anatomy).

Trochonanina mossambicensis Pfeiffer. E. V. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 46, Pl. I, fig. 8; var. *elatior* (E. v. MARTENS), *op. cit.*, p. 47, Pl. III, fig. 9; var. *albopicta* (E. v. MARTENS), *op. cit.*, p. 47.

Trochonanina (*Martensia*) *mozambicensis* Pfeiffer. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 199.

Martensia entebbana POLLONERA, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 561, p. 1 (type locality: between Entebbe and Madudu, Uganda); 1909, Il Ruwenzori, Parte Scientif, I, p. 194, Pl. XX, figs. 12 and 13.

Upper Ituri: Undussuma (typical form and var. *albopicta;* Stuhlmann Coll.). Beni in the Semliki Valley, and on the western slope of Mt. Ruwenzori, at 2000-3000 m. (Schubotz Coll.).

Faradje (Lang and Chapin Coll.).

In this lot of specimens the diameter is from 10.5 to 15.5 mm. All are typical in coloration. In the larger shells the last whorl is more convex above. Some of them agree quite exactly with Pollonera's description and figure of *Martensia entebbana.*

In estivation a thin but strong, parchment-like epiphragm closes the aperture.

"Close to the station of Faradje the annual grass-fires had cleared, in January, a swamp of nearly all its vegetation, which had obtained a height of some ten feet or more. The yellowish green, columnar stems of several wild bananas, growing on a slight elevation, now stood out conspicuously from the bare, blackened ground. At ordinary times, the lower portion of the trunk below the spreading green foliage is enveloped by many brown shriveled leaves. These had been consumed by the blaze and the bases of some of the lower leaf-sheaths had bent outward, disclosing great patches of estivating snails all belonging to one species (Pl. X, figs. 2 and 3). Each was affixed by a thin pellicle around its aperture which, further inward, was closed by an epiphragm. The snails had evidently sought refuge from the effects of the dry season near the proximal portion of the thick, juicy cellular sheaths, the moisture and coolness of which offered sufficient protection. Though many had been killed by the fire, more than two-thirds started to move soon afterwards. Most of them dropped and perished in the ashes, but a few found a safe retreat higher up between what was left of the green leaf-stalks and apparently continued their estivation there. Wild bananas are common at the base of isolated granite hills near Aba and Yakuluku and occur also in the forest" [H. L.].

163. **Ledoulxia mesogæa** (v. Martens)

Trochonanina mesogœa E. v. Martens, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 178 (type locality: forest region west of Lake Albert); 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 50, Pl. i, fig. 9; Pl. iii, fig. 15; and var. *böhmi* E. v. Martens, 1897, *op. cit.*, p. 50 (near Lake Tanganyika).

Semliki Forest: Bukende and Buginda (Stuhlmann Coll.).

Ituri Forest: Medje (Lang and Chapin Coll.).

One specimen exceeds the dimensions given by v. Martens: altitude, 15 mm.; diameter, 24.2 mm.; 6½ whorls.

The preserved animal is light drab, with the caudal horn and a streak on the neck dark gray, the latter by the black pigmented eye retractors showing through. The anatomy is described above (Figs. 111*a-d* and 112).

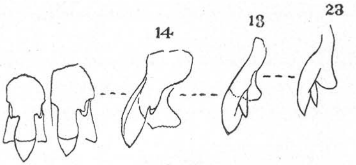

Fig. 112. Teeth of *Ledoulxia mesogœa* (v. Martens).

Ledoulxia mesogœa var. *nsendweensis* (Dupuis and Putzeys)

Trochonanina mesogœa var. *nsendweensis* Dupuis and Putzeys, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. lvii, fig. 28; and form *minor*, *op. cit.*, p. lvii. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 14.

Abundant in the whole Arab zone from Stanley Falls to Kasongo, but chiefly in the forested region and on the islands of the Lualaba River; the form *minor* from Nyangwe (Dupuis Coll.). Ngombe (near Irebu), La Lowa, Kibombo (Bequaert Coll.).

164. **Ledoulxia lessensis,** new species

Semliki Forest: Lesse (Bequaert Coll.).

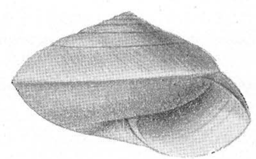
Fig. 113. *Ledoulxia lessensis*, new species.

The shell (Fig. 113) is depressed, acutely carinate. The apex is noticeably mucronate, the outline below it slightly concave, then becoming convex over the last two whorls; the base being flattened below the peripheral carina, then convex, and impressed around the narrow umbilicus. The embryonic whorls are convex, the rest but weakly so. The whorls increase slowly. The upper surface is between tawny olive and snuff brown; the base isabella colored, imperfectly transparent, and glossy; the upper surface having little gloss. The first whorl is radially rugose, the wrinkles low, interrupted and irregular; next whorl rather finely wrinkled radially and spirally striate, the striæ rather coarse, most prominent near the sutures. There are about 2½ embryonic whorls, after which the adult sculpture begins. The later whorls have very low, unequal, slightly curved and retractive, coarse radial folds, and over all a minute, slightly uneven striation, 15 to 20 striæ in 1 mm. on the back of the last whorl. There is a slight, close, superficial and uneven spiral striolation in places, and often oblique wrinkles on the sides of the striæ. The base has low, fine radial wrinkles and minute impressed striæ, the whole crossed by spiral impressed lines about half as wide as their raised intervals. It is coarser and more regular than in *L. mesogæa*, more like *L. mozambicensis*. The suture is scarcely impressed, the whitish keel projecting very slightly above it on most post-embryonic whorls. The aperture is broadly lunate. Peristome thin, triangularly dilated at the columellar insertion.

Altitude, 12 mm.; diameter, 20.3 mm.; 6⅓ whorls.

The last whorl is fuller and the keel less prominent than in *L. mesogæa*, and the whorls widen less rapidly. There is also a difference in sculpture. *L. rodhaini* (Dautzenberg and Germain), from the Lower Congo, is higher, with more whorls than in specimens of *lessensis* of the same or greater diameter. *L. permanens* Smith, of East Africa, has about the dimensions of *L. lessensis*, but the last whorl is more rounded, the carina far less prominent. In *L. mozambicensis* the outline of the spire is less curved and more simply so, and the number of whorls is as great in a much smaller diameter.

In genitalia (Fig. 114) it differs from *L. mesogæa* by the penial glands, as noted above. The specimen was much hardened, was broken in pulling, and the distal parts of both male and female organs are lacking. Length of penis, 7 mm.; of vagina, 4 mm.; of spermatheca and its duct, 17 mm.

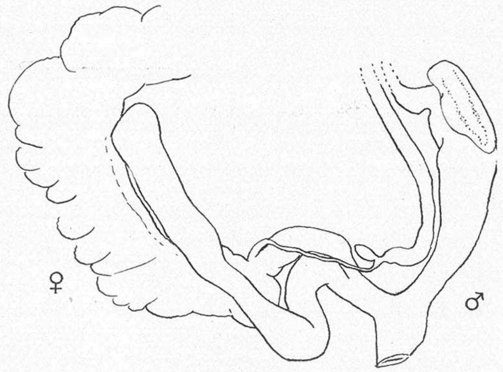

Fig. 114. Genitalia of *Ledoulxia lessensis*, new species.

Other Species of *Ledoulxia* Recorded from the Belgian Congo

Ledoulxia acutecarinata (Thiele)

Trochonanina (*Martensia*) *acutecarinata* J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 200, Pl. v, fig. 38.

In the forest 50 km. east of Kasongo, and also 300 km. west of Lake Tanganyika (Grauer Coll.).

Ledoulxia consociata (Smith)

Martensia consociata E. A. Smith, 1899, Proc. Zool. Soc. London, p. 584, Pl. xxxiii, figs. 32-34. Type locality: Masuku Plateau, Nyasaland, 6000-7000 feet.

Trochonanina (*Martensia*) *consociata* Smith. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 15.

Martensia (?) *shimbiense* Preston, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 530, Pl. viii, fig. 12. Type locality: Shimbi Hills, British East Africa; a synonym of *consociata* according to Dautzenberg and Germain.

Tekunini and Muombe (between Kiambi and Sampwe), Kundelungu Plateau, Muyumbwe (on the Luapula River) (Bequaert Coll.).

Ledoulxia densestriata (Thiele)

Trochonanina (*Martensia*) *densestriata* J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 200.

Type locality: west of the Ruzizi River, between Lakes Kivu and Tanganyika (Grauer Coll.).

Ledoulxia rodhaini (Dautzenberg and Germain)

Trochonanina rodhaini Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 14, Pl. i, figs. 8-10.

Type locality: Kisantu (Bequaert Coll.).

TROCHOZONITES Pfeffer

Trochozonites Pfeffer, 1883, Abhandl. Naturwiss. Ver. Hamburg, VII, 2, p. 23. For *T. percarinatus* (v. Martens) and *T. ibuensis* (Pfeiffer).

Moaria Chaper, 1885, Bull. Soc. Zool. France, X, p. 49. Type: *M. conica* Chaper.

Both of the species originally included in *Trochozonites* have the embryonic whorls sculptured with fine spiral striæ. Adolf d'Ailly, whose keen eye missed very little, found the same sculpture in many species of Kamerun and concluded that it was a generic character. There is, however, some diversity in embryonic sculpture among the Central African species, indicating three groups or subgenera, within the genus.

The number of embryonic whorls varies, in different species, from one and two-thirds to about two and one-half.

Type: *Trochonanina percarinata* v. Martens.

Moaria was based upon a West African species known by a single specimen, its author evidently being ignorant of the prior genus *Trochozonites*. The type of *Moaria* appears to resemble *T. plumaticostata* rather closely. The sculpture of its embryonic whorls is not known. Until differences are shown to exist, it may be considered an absolute synonym of *Trochozonites*.

Key to *Trochozonites* of the Belgian Congo

1. Embryonic whorls spirally striate. Subgenus *Trochozonites*, proper..........2.
Embryonic whorls microscopically, irregularly pitted. Subgenus *Zonitotrochus*.5.
Embryonic whorls subvertically ribbed, post-embryonic whorls strongly convex, with sculpture of oblique ribs. Subgenus *Teleozonites*....................7.

Trochozonites, proper

2. Sculpture of narrow, oblique riblets bearing short, triangular cuticular processes in spiral series; shell straightly conic; altitude, 6 to 7 mm.
T. plumaticostata, new species.
Sculpture of several spiral threads or delicate keels; shell smaller..........3.

3. Four spiral keels on the last, 3 on the earlier whorls crossed by many oblique laminæ, hairs at the intersections; altitude, about 5 mm., slightly exceeding the diameter; 6 whorls........................*T. bellula* (v. Martens).
Three delicate spirals, oblique sculpture very weak or wanting; diameter exceeding the altitude...4.

4. Altitude, 3 mm.; 6 to 7 whorls............*T. trifilaris* Dupuis and Putzeys.
Altitude, about 4.5 mm.; 5½ whorls.......*T. trifilaris ituriensis*, new subspecies.

Zonitotrochus, new subgenus

5. Later whorls obliquely ribbed..6.
Later whorls smooth; outlines slightly convex near the summit; altitude, 7.3 mm.; diameter, 6.7 mm..................*T. medjensis*, new species.

6. Lateral outlines strongly concave; diameter slightly exceeding the altitude; ribs rather widely spaced on the last whorl; altitude, 8.5 mm.; diameter, 11 mm.; to 10 × 11.5 mm................................*T. leptalea* Smith.
Lateral outlines nearly straight; altitude exceeding the diameter; ribs close; altitude, 6.7 mm.; diameter, 5 mm.................*T. aillyi*, new species.

Teleozonites, new subgenus

7. Shell wider than high; altitude, 5 mm.; diameter, 6 mm.
T. percostulata Dupuis and Putzeys.
Shell higher than wide; altitude, 7.1 mm.; diameter, 6.3 mm.
T. adansoniæ (Morelet).

Subgenus TROCHOZONITES Pfeffer, proper

Here are included all of the species having spiral striation without ribs on the embryonic whorls. The type is *Trochonanina percarinata* v. Martens, designated by Connolly, 1912, Ann. South Afr. Mus., XI, 3, p. 103.

165. **Trochozonites plumaticostata,** new species

Ituri Forest: Penge, type locality, and Avakubi. Semliki Forest: Moho near Lesse (Bequaert Coll.).

The shell (Fig. 115) is perforate, straightly trochiform, carinate, light brown. The apex is rather obtuse, the tip turned down. First one and three-fourths whorls with sculpture of spiral threads and lower, close and irregular striæ. Subsequent whorls have narrow, oblique, rather widely spaced, retractive, undulating riblets, bearing triangular cuticular appendages in spiral series; on the last whorl about five to eight such series may be counted in different places. Usually the appendages are partially lost. The whorls are moderately convex, having a thread-like keel just above the suture. On the last whorl the keel is well expressed. The base is moderately convex, smooth. The aperture is rather broadly lunate, angular at the termination of the carina. The columellar margin is somewhat expanded throughout.

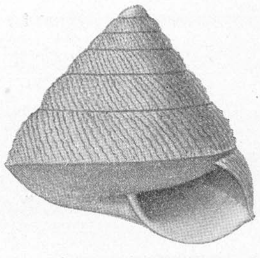

Fig. 115. *Trochozonites plumaticostata*, new species.

Length	*Diameter*	*Number of Whorls*	
6.0 mm.	6.1 mm.	6½	Penge; type
6.5	6.3	6¾	Avakubi
7.2	7.2	7½	Moho near Lesse

There is some variation in size and degree of elevation, but the series is so small that it is impossible to say that there are local differences. The measurements are from the largest examples in each lot. Only one was found near Lesse.

166. **Trochozonites bellula** (v. Martens)

Helix bellula E. v. Martens, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 15. Type locality: Buddu in Uganda.

Trochononina (Moaria) bellula E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 45, Pl. III, fig. 10.

Trochonanina (Trochozonites) bellula v. Martens. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 15, Pl. II, figs. 5 and 6.

Vieux Kassongo (Bequaert Coll.).

Ituri Forest: Penge, abundant; Avakubi, 1 specimen (Bequaert Coll.).

This strongly marked little snail has been well described and figured by Dautzenberg and Germain. Only the somewhat immersed tip, perhaps one-third of a whorl, is smooth, spiral threads then appearing, and soon thereafter vertical riblets. The embryonic shell includes slightly over 1½ whorls, the change to the neanic and final sculpture being abrupt.

Trochozonites trifilaris Dupuis and Putzeys

Trochozonites (Moaria) trifilaris Dupuis and Putzeys, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. liii, fig. 23.

Type locality: Nsendwe (Dupuis Coll.).

According to Germain, 1911, Bull. Mus. Hist. Nat. Paris, p. 234, this is only one of the varieties of *Trochozonites bifilaris* (Dohrn) =

Trochonanina bifilaris Dohrn, 1878, Jahrb. D. Malak. Ges., p. 155, from Liberia, which may have one, two, three, or five spiral threads.

167. **Trochozonites trifilaris ituriensis,** new subspecies

Ituri Forest: Medje, type locality (Lang and Chapin Coll.); Penge (Bequaert Coll.).

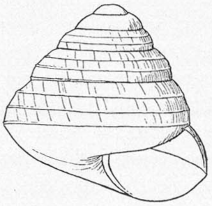

Fig. 116. *Trochozonites trifilaris ituriensis,* new subspecies.

The shell (Fig. 116) is trochiform, isabella colored, having three delicate carinæ or threads on each postembryonic whorl, closely resembling *T. trifilaris* Dupuis and Putzeys, from which it differs by the larger size with fewer whorls, the dimensions being as follows, those of *trifilaris* from Dupuis and Putzeys' description:

	Altitude	*Diameter*	*Number of Whorls*	
T. trifilaris	3.0 mm.	3.25 mm.	6 to 7	Nsendwe
T. t. ituriensis	4.6	5.00	5¾	Medje; type
T. t. ituriensis	4.3	4.70	5½	Penge

As in *trifilaris* and *bifilaris*, the first two whorls are minutely striate spirally.

While these forms are doubtless closely related to the West African *T. bifilaris* (Dohrn), there are differences in size and shape of the spire which appear to be specific until connecting specimens are shown to exist. As noted above, Germain considers *trifilaris* a variety of *bifilaris*. Adolf d'Ailly has shown that the spiral threads of the latter vary in number.

ZONITOTROCHUS, new subgenus

The embryonic whorls are microscopically densely pitted or pitted-granulose. Type: *T. medjensis,* new species. Probably some of the *Trochozonites* described as having smooth apical whorls belong here.

168. **Trochozonites (Zonitotrochus) leptalea** Smith

Trochozonites leptaleus E. A. Smith, 1909, Trans. Zool. Soc. London, XIX, p. 43, Pl. I, figs. 12 and 13. Type locality: Mobuku Valley on the eastern slope of Mt. Ruwenzori, 10,000-14,000 ft.

Mt. Ruwenzori: western slope in the Butagu Valley at 1800 m.; also in the Lamia Valley at 2000 m. (Bequaert Coll.).

Except in color the specimens agree well with Smith's description. They are not "*pallide cornea*" as he describes it, but cinnamon-brown above, dresden-brown beneath. It is well characterized by the concave outlines of the spire and the strong ribs.

169. **Trochozonites (Zonitotrochus) aillyi,** new species

Ituri Forest: Penge, type locality (Bequaert Coll.); Medje (Lang and Chapin Coll.).

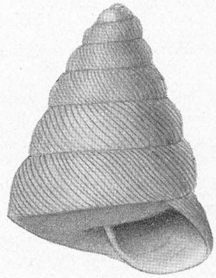

Fig. 117. *Trochozonites aillyi,* new species.

The shell (Fig. 117) is perforate, carinate, high conic, the apex obtuse, the lateral outlines nearly straight. Nearly two first whorls are microscopically, irregularly pitted. The following whorls have strong, very oblique and slightly curved riblets, nearly as wide as their intervals, about 10 in 1 mm. on the face of the last whorl (measured at right angles to the riblets). They weaken or disappear close above the suture and the peripheral keel. The intervals are microscopically granulose. A thread revolves immediately above the suture, appearing as a keel on the last whorl. The base is but slightly convex and glossy. Under the microscope it is seen to be minutely granulose, the granules partially arranged in spiral series. In very oblique light the minute spirals are more conspicuous. The aperture is broad, somewhat tetragonal. Columella subvertical, with narrowly expanded edge, dilated close to the insertion.

Length, 6.7 m.; diameter, 5 mm.; nearly 7 whorls.

This species is related to *T. leptalea* and *T. medjensis* by the sculpture of the embryonic whorls. *T. théeli* d'Ailly[1] probably belongs to the same group. All of these differ from *T. aillyi* in shape and in various details of sculpture.

The specimen from Penge is decolored but, as it has the apex perfect, it has been selected as type. That from Medje was taken alive, but the apex is broken. It is dull cinnamon above, between cream buff and colonial buff beneath, with a line of the darker color immediately below the keel.

170. **Trochozonites (Zonitotrochus) medjensis,** new species

Ituri Forest: Medje (Lang and Chapin Coll.).

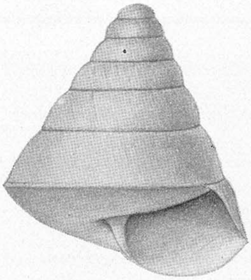

Fig. 118. *Trochozonites medjensis,* new species.

The shell (Fig. 118) is perforate, high trochiform, acutely carinate, the lateral outlines slightly concave in the upper half; summit obtuse, the base moderately convex; cream color. The apex is rounded; first 2½ whorls are convex, densely, irregularly and microscopically pitted or pox-marked; following whorls are somewhat convex, smooth, matt, the growth-lines weakly indicated below the suture. A thread-like keel revolves just above the suture, and is prominent on the last whorl. The base is glossy, weakly marked with growth-lines, and covered with an extremely light, dense, microscopic spiral striation. The aperture is trapezoidal, the peristome fragile, triangularly dilated at the columellar insertion.

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[1] 1896, Bihang Svenska Vet. Ak. Handl. Stockholm, XXII, 4, No. 2, p. 55, Pl. II, figs. 21-25. Bomana and Vevoka, Kamerun.

Length, 7.3 mm.; diameter, 6.7 mm.; 6¾ whorls.

Trochozonites sharpei E. A. Smith,[1] from Mt. Chiradzulu (in the Shire Highlands, south of Lake Nyasa), appears to be the most nearly related species. As *T. sharpei* is described as sculptured with delicate oblique growth-lines and is from a quite distant and diverse region, it is not likely to be specifically identical with the Medje snail.

Teleozonites, new subgenus

The embryonic whorls are ribbed to the apex. Type: *Helix adansoniæ* Morelet.

Several species are known at present to have this highly "accelerated" sculpture; probably there are others of which the early whorls have not been described. In *T. adansoniæ* there are spaced spiral striæ between the riblets of the embryonic stage.

171. **Trochozonites (Teleozonites) adansoniæ** (Morelet)

Helix adansoniæ Morelet, 1848, Rev. et Mag. de Zool., XI, p. 351 (type locality: Guinea); 1858, Séries Conchyliol., I, p. 13, Pl. i, fig. 4.

Trochozonites adansoniæ Morelet. d'Ailly, 1896, Bihang Svenska Vet. Ak. Handl. Stockholm, XXII, 4, No. 2, p. 46. Germain, 1908, in A. Chevalier, L'Afrique Centrale Française, pp. 474 and 164.

A. d'Ailly records this species from Kamerun; Germain from Tete (on the Chari River) and Krebedje (Fort Sibut).

Ituri Forest: Medje (Lang and Chapin Coll.); Penge (Bequaert Coll.).

The shell (Fig. 119) is perforate, straightly conic, tawny-olive, carinate. The first two whorls have slender, subvertical riblets, much narrower than their intervals, and not reaching quite to the suture below; the intervals crossed by delicately spiral threads about as wide apart as the riblets. This sculpture extends to the apex. Subsequent whorls have strongly retractive straight ribs. Measured along the keel on the front of the last whorl there are about three in one millimeter, but at right angles to the ribs there are about

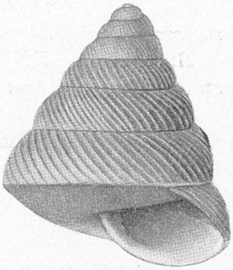

Fig. 119. *Trochozonites adansoniæ* (Morelet).

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[1] 1899, Proc. Zool. Soc. London, p. 585.

four. Extremely minute, close and superficial spiral striæ may be seen in the intervals. The base is glossy, marked with fine growth-lines. The whorls are all strongly convex, the last rather weakly convex at the base, having a delicate peripheral keel, which may also be seen close above the suture on the post-embryonic whorls of the spire. The last whorl descends slightly below the keel. The aperture is somewhat trapezoidal, oblique. The columellar lip is triangularly reflected at the insertion.

Altitude, 7.1 mm.; diameter, 6.3 mm.; 6¾ whorls.

T. buhambaënsis Preston resembles this species in shape, but the first three whorls are said to be smooth. The sculptured embryonic whorls of *T. adansoniæ* are its most remarkable feature.

T. percostulata Dupuis and Putzeys is closely related to *T. adansoniæ*. It is a shorter, broader species, having embryonic sculpture similar to the present form.

Other Species of *Trochozonites* Recorded from the Belgian Congo

Trochozonites buhambaënsis Preston

Trochozonites buhambaënsis Preston, 1914, Proc. Zool. Soc. London, p. 804, Pl. ii, fig. 23.

Type locality: Buhamba near Lake Kivu (Kemp Coll.).

Trochozonites expatriata Preston

Trochozonites expatriata Preston, 1914, Proc. Zool. Soc. London, p. 805, Pl. ii, fig. 21.

Type locality: Burunga at the foot of Mt. Mikeno, 6000 ft. (Kemp Coll.).

Trochozonites kempi Preston

Trochozonites kempi Preston, 1914, Proc. Zool. Soc. London, p. 805, Pl. ii, fig. 22.

Type locality: Buhamba near Lake Kivu (Kemp Coll.).

Trochozonites percostulata Dupuis and Putzeys

Trochozonites percostulatus Dupuis and Putzeys, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. liv, fig. 24.

Trochonanina (*Trochozonites*) *percostulata* Dupuis and Putzeys. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 15.

Nsendwe and Lokandu (Dupuis Coll.); type locality not designated. Bukama (Bequaert Coll.).

Helixarioninæ

Zonitidæ having a thin shell of vitrinoid shape. Foot with a large caudal gland. Epiphallus developed. Vagina very short or hardly distinct from the atrium. Marginal teeth bifid. The right ocular retractor passes between male and female terminal ducts of the genitalia.

In the group of South African genera which Godwin-Austen has segregated as Peltatinæ (*Peltatus, Kerkophorus, Microkerkus*) the mantle, foot, genitalia, and dentition scarcely differ from Helixarioninæ, except that there is a distinctly developed vagina; but the shell is less degenerate, being globosely helicoid; so that in the present unsettled condition of the classification of Zonitidæ it seems best to leave the groups apart.

The pallial organs of *Helixarion bequaerti* are photographed in Pl. XXII, fig. 6. The lung is short and broad, as in slugs, the kidney, ureter and pericardium occupying a great part of its area. Branches of the pulmonary vein cover the kidney, also extending backward upon the large pericardium. Both the retrograde and the advancing portions of the ureter are unusually broad. The right side of the lung (left in the figure) is copiously veined, the left side much less, the markings seen in the figure being mainly wrinkles. The left shell-lobe is seen below on the right. In other species examined the structure is similar except that the venation does not extend over the kidney and pericardium.

In tropical Africa the Helixarioninæ appear to be represented as abundantly as in India. Since in both areas there has been evolution towards slug-like forms, with reduction of the shell and enlargement of the shell-lobes of the mantle, the species of the two areas are often superficially similar. Close inspection, however, of species anatomically known, reveals differences which indicate parallel series, doubtless derived from similar helixarionid ancestors. The Indian *Austenia, Cryptosoma, Girasia,* can be matched by African forms in the same stages of mantle and shell evolution, but certainly different generically.

The little-known West African genus *Aspidelus* Morelet and possibly also *Leptichnus* Simroth, may turn out to be advanced members of the *Helixarion* series. The shell is more degenerate than in the Indian *Girasia.* The Urocyclidæ are evidently a branch of the helixarionid stock, in which remoulding to the slug form has been completed. From the general distribution, the rather large number of minor phyletic lines, and the mature adaptive radiation, we may infer that helixarionid snails have long existed in Africa, and are not one of the groups derived from the Oriental Region in the late Tertiary.

The *Helixarion* group comprises about fifty described species in tropical Africa, of which the soft anatomy has been investigated hitherto in about a dozen. There is considerable variety in the degree of reduction of the shell, in the development of the mantle lobes and in the genitalia; yet no definite classification of the whole series will be possible until many more are dissected, since the shells are uncharacteristic.

I have ventured to formulate a tentative classification of those studied on this occasion, as a basis for further work and criticism.

At present, most of the species have to be left in *Helicarion*, or as it was originally spelled, *Helixarion*,—a nearly meaningless mass of materials which nobody can utilize until the descriptive work is all done over from a different standpoint.

The degree of mantle development, used as most convenient in the following key to divide the group primarily, is probably of secondary value. *Granularion*, *Mesafricarion*, and *Zonitarion* appear to be more closely related than either is to *Africarion* or *Gymnarion*.

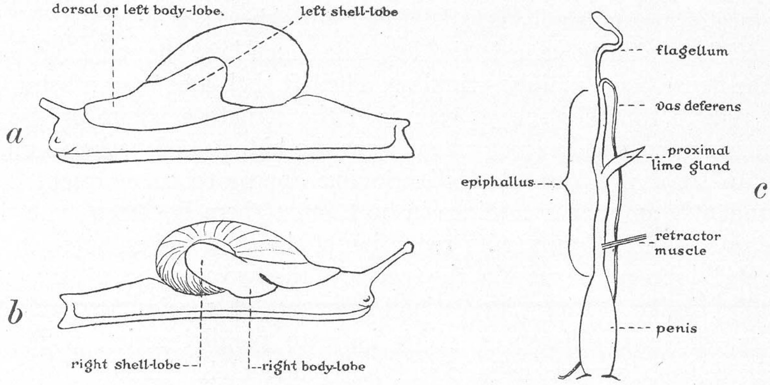

Fig. 120. Diagrams illustrating structural characters of Helixarioninæ used in the key below: *a*, left, and *b*, right sides of body; *c*, male organs.

Key to Tropical African Genera and other Groups of Helixarioninæ

1. Right and left shell-lobes of mantle broadly connected and continuous over the anterior border of the shell.......................................2.
   Right and left shell-lobes remote, separate, or but weakly connected in front...5.
2. Shell-lobes broadly concrescent both in front and behind, leaving a median patch of the shell exposed in alcoholic specimens. Epiphallus with flagellum and lime gland.......................................Genus *Zonitarion* Pfeffer.
   Shell-lobes not concrescent posteriorly; no dart gland....................3.
3. Epiphallus without any appendages (no flagellum or lime gland).
   Genus *Africarion* Godwin-Austen.
   Epiphallus having a flagellum and sometimes a proximal lime gland. Sheath of the penis enveloping the penis and epiphallus as far as the retractor muscle. *Mesafricarion*, new genus.......................................4.
4. Penial sheath containing only penis and epiphallus...... *Mesafricarion*, proper.
   Penial sheath containing a long, fleshy, excitatory organ as well as the male duct.......................................*Belonarion*, new subgenus.

5. Epiphallus without any appendages; a long, club-shaped dart gland. Shell-lobes of the mantle quite small or minute..........*Gymnarion*, new genus.
   Epiphallus terminating in a flagellum. Genus *Helixarion* Férussac..........6.
6. No proximal lime gland or dart gland. Shell-lobes of mantle broadly rounded. *Helixarion*, proper.
   Epiphallus having a well-developed flagellum and a proximal lime gland; a globose or oval dart gland at the base of the oviduct (rarely reduced or wanting)..........7.
7. Shell-lobes rounded, broadly tongue-shaped. Foot but little flattened, not laterally keeled under the shell..........Subgenus *Granularion* Germain.
   Foot excavated and laterally keeled under the shell..........8.
8. Both shell-lobes narrow, lanceolate or triangular: dart gland oval. *Angustivestis*, new subgenus.
   Right shell-lobe large, broadly rounded; dart gland mushroom-shaped, with extremely thick, muscular walls..........*Entagaricus*, new subgenus.

MESAFRICARION, new genus

Similar to *Africarion* externally, the ample right and left shell-lobes of the mantle being broadly united over the anterior border of the shell, but differing in genitalia. The epiphallus has a short flagellum and sometimes a proximal lime gland. It is partially included within the penial sheath, to which the penial retractor muscle is attached. There is no dart sac or amatorial gland.

Type: *M. maculifer*, new species.

Africarion[1] has no appendages on the epiphallus and no dart sac. *Zonitarion*[2] has the shell-lobes of the mantle concrescent posteriorly as well as anteriorly, so that the posterior convexity of the shell is covered, even in alcoholic specimens. The epiphallus appears to be like that of *Mesafricarion*. The genitalia have not been figured.

Subgenus MESAFRICARION, proper

172. Mesafricarion maculifer, new species

Plate XXII, Figures 1 and 1*a*

Stanleyville, type locality (Lang and Chapin Coll.). Mt. Ruwenzori: western slope in the Lanuri Valley (Bequaert Coll.).

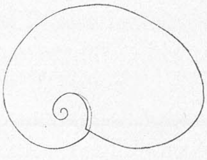

Fig. 121. Shell of *Mesafricarion maculifer*, new species. Stanleyville. From above, ×2.

The shell (Fig. 121) is thin, yellow, glossy, the calcareous layer very thin, the spire level. There are two and one-third whorls, the first half whorl having fine radial striæ, next half with numerous distinct, punctate spiral lines. The last one and one-third whorls have some slight undulations along growth-lines, but otherwise the surface is smooth and polished. Diameter, 13 mm.

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[1] *Africarion* Godwin-Austen, 1883, Land and Fresh Water Mollusca of India, I, 4, p. 154; for *Africarion pallens* (Morelet).

[2] *Zonitarion* Pfeffer, 1883, Abhandl. Naturwiss. Ver. Hamburg, VII, 2, p. 11. First species, here selected as type, *Z. semimembranaceus* (v. Martens); Kamerun. See also d'Ailly, 1896, Bihang Svenska Vet. Ak. Handl. Stockholm, XXII, 4, No. 2, p. 34, Pl. I, figs. 44-48.

The foot is maculated irregularly with black on a dull buff ground, the marking profuse on the tail. The tail is broadly flattened under the shell, the flattening bounded by prominent keels extending forward and downward on the flanks. Behind these is a rather short high keel. The terminal pore is linear, widened above, as usual, and without a distinct horn, though somewhat prominent above. The sole is dirty buff. Length, 23 mm.

The mantle is distinctly granulose and is rather profusely dappled with black on dirty buff. The left body lobe is very broad, particularly in front. The shell-lobes are broadly united, the left in form of a rather narrow band, the right lobe broadly tongue-shaped, covering most of the spire.

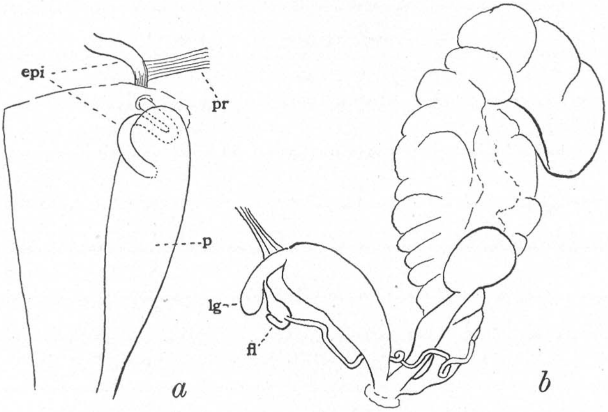

Fig. 122. *Mesafricarion maculifer*, new species. Stanleyville. *a*, penis sac opened longitudinally; *b*, general view of genitalia. epi, epiphallus; fl, flagellum; lg, lime gland; p, penis; pr, penial retractor.

Genitalia (Fig. 122).—The penis is very large, with the epiphallus apical. When opened lengthwise (Fig. 122*a*) it appears that there is an outer sheath which is penetrated by the epiphallus, and which envelopes the penis proper. This has muscular walls and a capacious cavity, lined with close, very fine papillæ longitudinally arranged. No penis-papilla. The epiphallus is divided into two parts by a contraction. The larger part terminates in an oblong lime gland. It appears short, but the greater portion is concealed within the penial sac. The smaller or distal part is somewhat glandular and bears a short flagellum beyond the insertion of the vas deferens. The retractor muscle attaches to the epiphallus and distally to the diaphragm.

Length of penis, 6.5 mm.; of penial retractor, 3 mm.; visible part of epiphallus and flagellum, 2.3 mm.

There is no dart sac. The other organs are sufficiently shown in the figure.

The specimen from Mt. Ruwenzori (Pl. XXII, fig. 2; text figure 123) differs from the type by having a more prominent caudal horn. The shell has an uncalcified crescent along the columellar margin. There are about eleven punctate spirals on the first whorl, some of them extending nearly to the apex. Altitude, about 5.5 mm.: diameter, 13 mm.

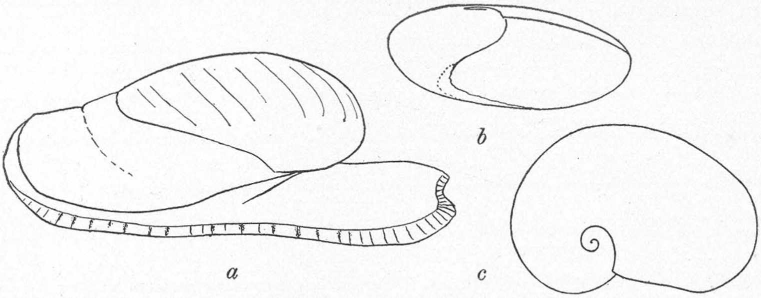

Fig. 123. *Mesafricarion maculifer*, new species. Mt. Ruwenzori. *a*, left side of animal; *b* and *c*, two views of shell, × 2½.

173. **Mesafricarion haliotides** (Putzeys)

Helicarion haliotides Putzeys, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lix, figs. 14 and 15. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 13.

Nsendwe (type locality; Dupuis Coll.). Bukama (Bequaert Coll.).

Ituri Forest: Penge (Bequaert Coll.).

The much depressed, nearly flat shell with membranous base is characteristic. Under the microscope the first whorl is smooth, or at least without spiral series of punctures. The last whorl has a microscopic sculpture of irregular, anastomosing spiral striæ or minute wrinkles.

The foot and mantle are dirty yellow, maculate with black, chiefly on the sides of the tail and front of the mantle. The tail is flattened under the shell, the flattening bounded by lateral keels; carinate behind the flattening, with a short caudal horn.

The mantle (Fig. 124*a* and *b*) is broad in front and on the left side, reflected over the shell in a rather narrow band tapering backwards. The right shell-lobe is large and tongue-shaped, having a low median ridge. It is continuous with the band-like left lobe. The lobes are not noticeably connected posteriorly, the top and posterior part of the shell being exposed in alcoholic examples.

The penis (Fig. 124*c* and *d*) is fusiform, the epiphallus entering it just below the gland which forms its apex. The internal structure, imperfectly seen, seems to resemble that of *M. maculifer*. There is a short flagellum (fl).

The shell of this species resembles that of the West African *Zonitarion semimembranaceus* (v. Martens), but, according to d'Ailly's figures, the shell-lobes of the mantle are united behind in that species, covering the posterior convexity of the shell, while in this they are united in front only. As in *semimembranaceus*, there is a fleshy ridge on the right shell-lobe.

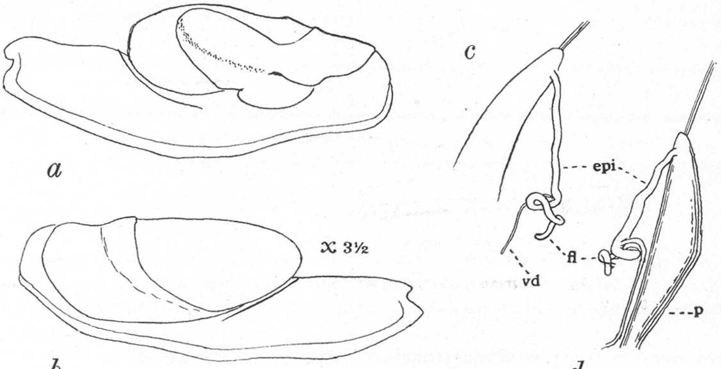

Fig. 124. *Mesafricarion haliotides* (Putzeys). Outline of right (*a*) and left (*b*) sides showing form and extent of mantle lobes in a preserved specimen; *c* and *d*, both sides of penis (p) and epiphallus (epi): fl, flagellum; vd, vas deferens.

174. **Mesafricarion auriformis** (Thiele)

Helicarion lymphascens Morelet. E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 38 (not *H. lymphaseus* Morelet, 1872).

Helicarion auriformis J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 197, fig. xxiv; Pl. vi, figs. 67-69.

Mt. Ruwenzori, western slope in the Butagu Valley at about 2600 m. (type locality; Stuhlmann Coll.). Island Kwidjwi and Upper Ituri (Schubotz Coll.).

Mt. Ruwenzori: western slope in the Butagu Valley at about 2200 m. (Bequaert Coll.).

Several empty shells agreeing well with this species.

BELONARION, new subgenus

The animal resembles *Mesafricarion* externally, in form and relations of shell, foot, and mantle. The large shell-lobes of the latter are concrescent in front. The epiphallus terminates in a flagellum and is continued within the cavity of the penis. A massive excitatory organ occupies the greater part of the penial sac.

Type: *Mesafricarion putzeysi*, new species.

175. **Mesafricarion (Belonarion) putzeysi,** new species

Plate XXII, Figure 5

Stanleyville (Lang and Chapin Coll.).

The shell (Fig. 125*a*, *b*) is dresden brown or somewhat darker, the first whorl white, glittering; thin without perceptible calcareous layer, the base "membranous" (that is, so thin that it does not keep its shape), forming an open spiral. The edge of the outer lip is also limp. The spire is very small, not raised. There is no punctation or spiral sculpture. The first whorl has weak, close, irregular granulation, the last whorl being smooth except for the usual weak growth-marks, and increasing in width very rapidly.

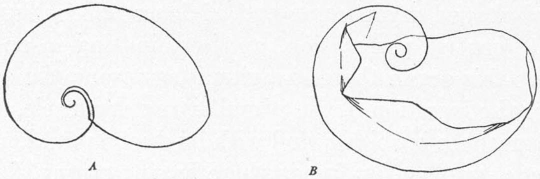

Fig. 125. *a* and *b*, *Mesafricarion putzeysi*, new species.

Diameter, 9.3 mm.; 2 whorls.

The foot is olive-brown, the shade becoming a little darker on the shell-lobes of the mantle. The flanks are without obliquely descending grooves, finely granose. The tail is flattened for half its length, then has a high keel to the end. There is a well-developed caudal horn above the pore. Length, 16 mm.

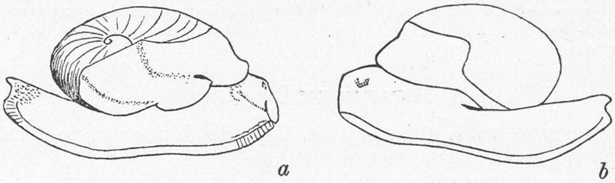

Fig. 126. *Mesafricarion putzeysi*, new species. Right (*a*) and left (*b*) sides of alcoholic specimens.

The mantle (Fig. 126*a* and *b*) is weakly granular. The right body-lobe is well developed; right shell-lobe very large, broadly tongue-shaped. The left body-lobe is very narrow at the side, rather wide anteriorly. The left shell-lobe is smaller than the right, triangular, and is broadly united with the right.

The greater part of the visceral mass is ochraceous-buff when the shell is removed.

Genitalia (Fig. 127*a-c*).—The penis is very large, 5 mm. long, with the retractor muscle subterminal, about 2 mm. long, inserted distally on the diaphragm. The epiphallus is convoluted, terminating beyond the vas deferens in a tightly knotted flagellum. Upon opening the penis (Fig. 127*b*) the epiphallus is seen to penetrate the rather thin-walled sac near its apex, and continue downward to the atrium, being convoluted near the latter. The greater part of the penial sac is occupied by a stiff, awl-shaped organ composed of dense, glossy muscular tissue with a minute central perforation, and terminating in an acute point below. Above this organ there is a gland occupying the apical part of the sac, under the insertion of the penial retractor muscle.

The spermatheca is oblong, and with its duct 6 mm. long. The base of the oviduct is swollen, its lumen there having strong, fleshy longitudinal corrugations.

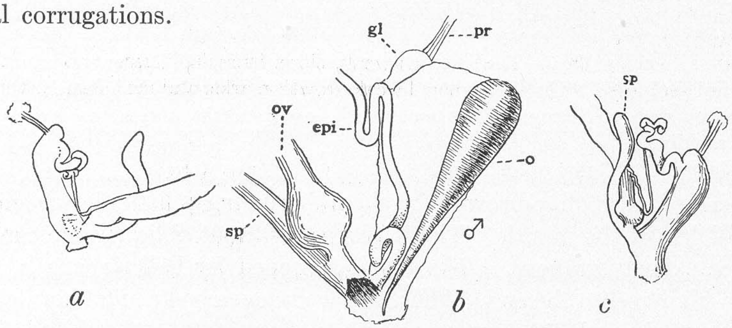

Fig. 127. *Mesafricarion putzeysi*, new species. *a* and *c*, right and left sides of the terminal ducts; *b*, outer sac of penis gland opened to show the internal continuation of the epiphallus and the awl-shaped organ. epi, epiphallus; gl, gland occupying summit of penis; o, awl-shaped organ; ov, oviduct; p, penis; pr, penial retractor; sp, duct of spermatheca.

HELIXARION Férussac

Helixarion FÉRUSSAC, 1821, Tableau Syst. Fam. des Limaçons, pp. 19 and 20, for *H. cuvieri* Férussac and *H. freycineti* Férussac.

Helicarion J. E. GRAY, 1847, Proc. Zool. Soc. London, p. 169; *H. cuvieri* Férussac designated as type.

Laconia J. E. GRAY, 1855, Catalogue Pulmonata Brit. Mus., pp. 51 and 63; for *L. ferussaci* Gray.

In the typical *Helixarions* of Australia, described by Semper and Godwin-Austen, there are moderately large, separated right and left shell-lobes; the epiphallus terminates in a flagellum, and there is no dart sac. Whether any African snails are strictly congeneric with the Australians appears questionable; yet the series herein referred to *Granularion* does not differ greatly, and for the present that group may be ranked as a subgenus.

Subgenus **GRANULARION** Germain

Granularion GERMAIN, 1912, Bull. Mus. Hist. Nat. Paris, p. 256; type: *Helicarion (Granularion) duporti* Germain.

The type species of this group has a shell with punctate apical whorl and no spiral striation of the last whorl. The mantle lobes are conspicuously granular, but their form is quite imperfectly described, and no information has been given on the internal anatomy.

Until the type is dissected we cannot know just what *Granularion* is; but I am taking the risk of using the name for species related to *Helicarion insularis* Thiele. In these forms the mantle lobes are wholly separated, or only quite weakly united by a narrow rim in front; the epiphallus has a well-developed flagellum, more or less swollen distally, and a smaller lime gland. The so-called dart sac, or amatorial gland, is short, semiglobose or oval, quite unlike that of *Gymnarion*, but in some species it is much reduced.

The presence of a lime gland and usually a dart gland differentiate the group from *Helixarion* proper.

The following species dissected by Thiele belong to this group: *Helicarion stuhlmanni* v. Martens, *H. issangoensis* Thiele, and *H. volkensi* Thiele.

176. **Helixarion (Granularion) insularis** (Thiele)

Plate XXII, Figures 4, 7, and 7*a*

Helicarion insularis THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 192, figs. xv and xvi; Pl. v, fig. 35.

Island Kwidjwi (type locality; Schubotz Coll.).

Rutshuru, in the forest gallery of the Rutshuru River, abundant; also from Penge, 1 specimen (Bequaert Coll.).

The foot and mantle are chamois colored, the top of the head dusky. The tail is very little flattened, hardly carinate behind. There is a short caudal horn and a capacious pore. The flanks have weak oblique grooves.

The mantle is distinctly granulated, very wide in front. The right and left lobes are large, obliquely, broadly tongue-shaped, weakly connected. The right lobe extends over the spire of the shell in the alcoholic examples.

Genitalia (Fig. 128*a* and *b*).—The penis is stout. Epiphallus is rather slender. It bears a short proximal lime gland a short distance (2.3 mm.) beyond the insertion of the retractor muscle, and terminates in a longer flagellum. The dart sac is a hemispherical protuberance on the oviduct.

Length of penis, 7 mm.; of epiphallus, 9 mm.; of flagellum, 4 mm.

A specimen from Penge is figured, Pl. XXII, figs. 7 and 7*a*. It differs from the Rutshuru examples by having the left shell-lobe of the mantle smaller, and in the different color. It is cartridge buff with dusky reticulation and some small dusky spots on the flanks and foot-fringe. The central field of the sole is isabella color, side fields olive. There is a short tail horn.

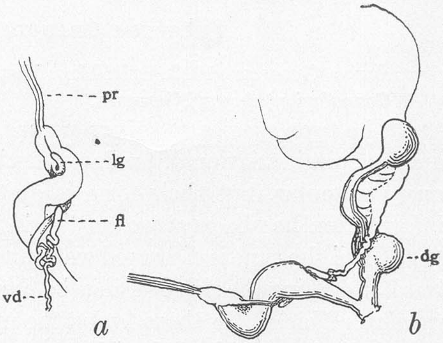

Fig. 128. *Helixarion* (*Granularion*) *insularis* (Thiele). *a*, ♂ ducts; *b*, lower part of genitalia: dg, dart gland; fl, flagellum; lg, lime gland; pr, penial retractor; vd, vas deferens.

177. **Helixarion (Granularion) subsucculentus,** new species

Mt. Ruwenzori: western slope in the Butagu Valley at about 3000 m., type locality; also in the Lanuri Valley at about 3000 m. (Bequaert Coll.).

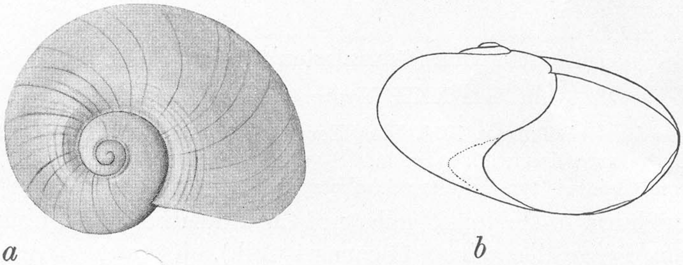

Fig. 129. *a* and *b*, *Helixarion* (*Granularion*) *subsucculentus*, new species. Shell, × 2⅔.

The shell (Fig. 129*a* and *b*) is thin, yellow, glossy, with noticeably raised spire and well-rounded periphery. The last whorl has rather well-marked wrinkles of growth, and near the suture a few coarse but extremely shallow spiral furrows. The early whorls are smooth, the shell having no noticeable microscopic sculpture. The aperture is indistinctly subquadrate. Peristome not membranous.

Altitude, 9 mm.; diameter, 15 mm.; 2½ whorls.

The foot is not flattened under the shell, and is carinate behind; a short horn projects above the caudal slit. There are but few oblique grooves on the flanks, the areas between them divided and then subdivided, the impressed network blackish, the granulation buff; foot-fringe buff with dusky lines. The sole is plumbeous.

The mantle is buff maculate with black, the part concealed under the shell is cream-white with some very irregular grayish markings. The right shell-lobe is broadly tongue-shaped. Left shell-lobe rounded (Fig. 130*d* and *e*).

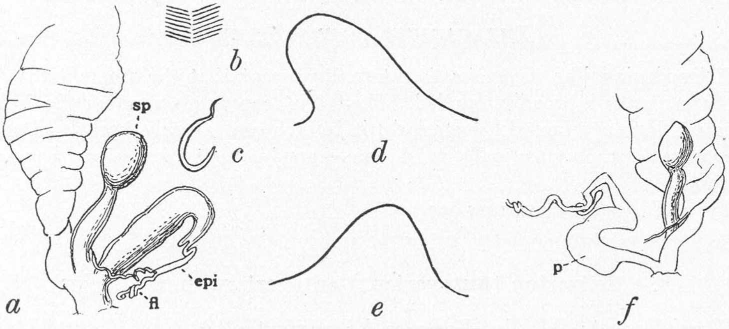

Fig. 130. *Helixarion* (*Granularion*) *subsucculentus*, new species. *a*, lower genital ducts of the type specimen from the Butagu Valley: epi, epiphallus; fl, flagellum; sp, spermatheca; *d*, right and *e*, left lobes of the mantle of the same; *f*, genitalia of a variety from the Lanuri Valley with detail of internal corrugation of penis (*b*) and a spermatophore (*c*): p, penis.

Genitalia (Fig. 130*a-c*).—The penis has a thin outer sheath. There is a quite short papilla at the apex of the lumen, which has transversely plicate walls. The epiphallus has a small lime gland and a rather long flagellum. The penial retractor was not seen. There is no dart sac, unless it is represented by a very weak dilation of the lower part of the oviduct.

This species had been provisionally identified by the shell with *Helixarion succulentus* (v. Martens); but while the genitalia of that appear to be rather similar, according to Thiele's figure, the external features are different. Von Martens states that there is "ein schwarz gefleckter, länglich lanzettförmiger Schalenlappen aus der oberen Ecke der Mündung hervortretend." This is quite unlike the broadly rounded, tongue-shaped right shell-lobe of the present species, and indicates that *succulentus* groups rather with *H. ruwenzoriensis*.

A specimen from the second locality mentioned above has the shell slightly more depressed than the type, possibly due to decalcification, as the base is dented in. There are no spirals near the suture, and the upper surface has strong, coarse radial waves. The foot and mantle are dirty yellowish, visceral sac white. The tail is slightly flattened under the shell, not carinate. Mantle lobes as in the type. The penis is transversely, finely plicate within as shown in the detail figure (Fig. 130*b*). Retractor muscle not found. One side of the oviduct is distinctly swollen. Tubular, white spermatophores, pointed at the ends, were found in the cavity of the penis (Fig. 130*c*).

ENTAGARICUS, new subgenus

Helixarioninæ like *Angustivestis* externally except that the ample right shell-lobe of the mantle is broadly rounded. The tail is deeply excavated for the shell, the excavation laterally keeled; posteriorly it is high and acutely keeled. Dart sac having very thick muscular walls, mushroom-shaped in the type species. Lime gland very short.

Type: *H. entagaricus*, new species.

178. **Helixarion (Entagaricus) entagaricus**, new species

Ituri Forest: Medje (Lang and Chapin Coll.).

"In the primary Rain Forest, on especially moist sites and elsewhere during wet periods, these snails are seen, usually with foot far extended, crawling on leaves of bushes often more than five feet above the ground. When handled the foot is contracted, the soft shell becomes nearly hidden from view, and abundant slime is excreted" [H. L.].

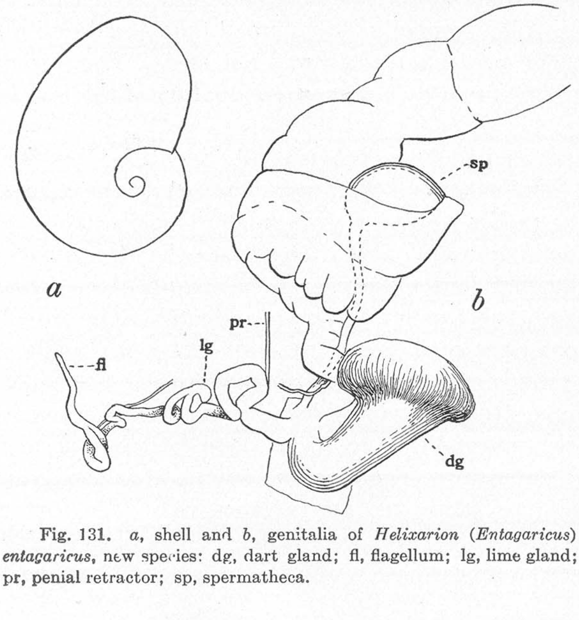

Fig. 131. *a*, shell and *b*, genitalia of *Helixarion* (*Entagaricus*) *entagaricus*, new species: dg, dart gland; fl, flagellum; lg, lime gland; pr, penial retractor; sp, spermatheca.

The shell (Fig. 131*a*) has a plane spire, is yellow and smooth except for the usual slight growth-wrinkles and some irregular short impressions at right angles with them. Whorls 2½, very rapidly enlarging, the base partly membranous.

Altitude, about 4 mm.; diameter, 7 mm.

The foot and mantle are copiously maculated and marbled with black on a pale ground, whitish in some, buff in other examples, the latter probably stained. The ridge of the tail is light.

The tail is deeply excavated for the shell in half of its length, the flattened part bounded by strong keels which continue obliquely downward for a short distance on the sides. The posterior half is high, compressed, acutely keeled. Caudal horn rather prominent. The sole is pale, without black markings.

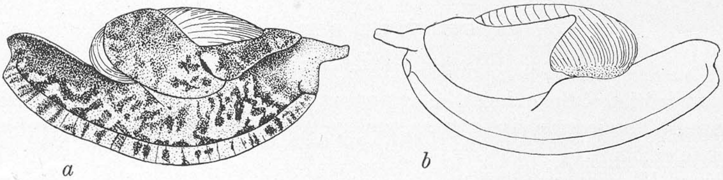

Fig. 132. *Helixarion* (*Entagaricus*) *entagaricus*, new species. Right (*a*) and left (*b*) views of the preserved animal.

The right shell-lobe (Fig. 132*a*) of the mantle is ample (8 mm. long in the type), broadly rounded, covering the spire and part of the last whorl around it. The left lobe (Fig. 132*b*), also rather ample, is triangular.

Length of foot of type, 27 mm. Length of a more extended specimen, 36 mm.

The male organs (Fig. 131*b*) are as usual in *Granularion*, except that the lime gland is quite short and blunt. The atrium is very short, the several ducts entering at about the same level. There is a large mushroom-shaped dart gland, having enormously thick walls composed of many concentric and muscular sheets. The lower half has a cavity filled with softer glandular tissue. The spermatheca is subglobular, on a rather long slender duct, and imbedded between convolutions of the uterus. The lower part of the oviduct is rather ample.

Length of dart sac, 8 mm.; width of same distally, 6 mm.; length of spermatheca and duct, 10 mm.

As the material had been preserved in formalin the shell could not be removed, the calcareous layer being soft. At the base all trace of calcification is wanting, as indicated by the dotted area in Fig. 132*b*, and I presume that part was not calcified, though it may have been slightly so. The dart sac of this species is highly characteristic, unlike that of any other known snail. The jaw is smooth, not much arched, with a low median projection. The teeth (Fig. 133) are all tricuspid except the outer marginals, but the innermost laterals have only a quite small entocone. On all side teeth it is united with the mesocone. On the outer marginal teeth the entocone also ascends the mesocone.

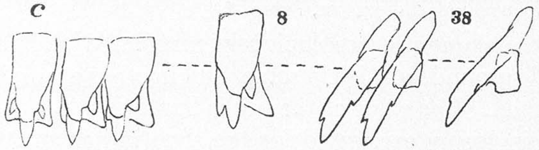

Fig. 133. Teeth of *Helixarion* (*Entagaricus*) *entagaricus*, new species.

ANGUSTIVESTIS, new subgenus

Helixarions having flagellum and lime gland on the epiphallus, an oval dart gland at the base of the oviduct. The first whorl of the shell has no spiral series of punctures. The mantle has narrow, widely separated right and left shell-lobes, lanceolate or blunt.

Type: *H. niger*, new species.

Helixarion kivuensis (Thiele) and *H. schubotzi* (Thiele) belong to this group.

179. **Helixarion (Angustivestis) niger,** new species

Plate XXII, Figure 3

Masisi (Bequaert Coll.).

The shell (Fig. 134) is large, thin, ochraceous-tawny, the first whorl clear whitish. Upper surface convex, rather dull. Initial half whorl nearly smooth, the next whorl finely but distinctly radially costulate, the fold-like riblets being somewhat oblique. Following whorl coarsely plicate radially and microscopically striate spirally. The last whorl has well-developed, crowded and minute striæ along lines of growth, covered with a microscopic spiral striation, and there is a coarse sculpture of several shallow spiral sulci on the inner half of the whorl, numerous protractive or forwardly descending sulci on the outer half. The base is glossy, the minute sculpture of the upper surface being almost effaced. The peristome is membranous.

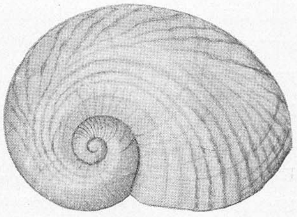

Fig. 134. *Helixarion* (*Angustivestis*) *niger*, new species. Shell.

Altitude, about 16 mm.; diameter, 29 mm.; 3 whorls.

The foot is broad and black (length, 43 mm.; width, 11 mm., in the contracted specimen). The tail is deeply excavated under the shell, but behind that is elevated in a compressed crest. The flanks have about

17 distinct oblique grooves, weakly granulated between the grooves. In front of the mantle the skin is roughly granular, with two contiguous dorsal furrows. The pedal furrows are rather deep, the wide fringe below being closely grooved. There appears to be no horn above the caudal pore, which is wide above, linear below. The body-lobe of the mantle is broad in front, very narrow on the left side. There are subequal long and slender right and left shell-lobes, longer than in *H. aloysii-sabaudiæ*, but very small for an animal of this size. The left lobe is 5.5 mm. long, 3 mm. wide at the base, shaped about as figured for *H. kivuensis*.

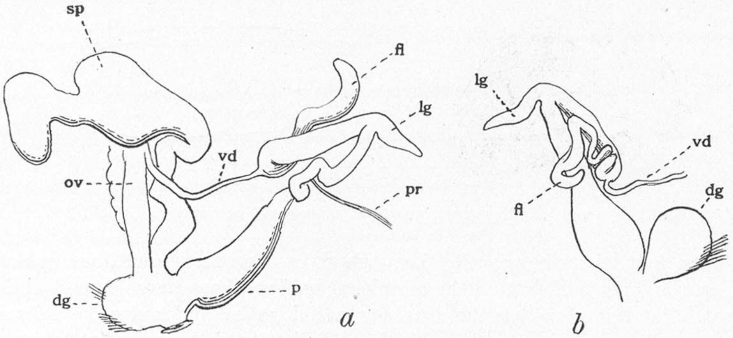

Fig. 135. *Helixarion* (*Angustivestis*) *niger*, new species. *a*, end ducts of genitalia; *b*, opposite side of penis and dart gland: fl, flagellum; dg, dart gland; lg, lime gland; ov, oviduct; p, penis; pr, penial retractor; sp, spermatheca; vd, vas deferens.

The genitalia (Fig. 135*a* and *b*) are complicated. There is a globular, blackish amatorial or dart sac, thick-walled on three sides, containing a rather large light colored papilla. The penis is thick, tapering distally into the more slender epiphallus which bears a tapering lime gland. The slender penial retractor muscle is inserted at about the proximal third. The epiphallus has a convoluted glandular flagellum (Fig. 135, fl). The spermatheca is of irregular shape, its duct convoluted.

Length of penis, 5 mm.; of epiphallus, 9.5 mm.; of flagellum, 11.5 mm.

This species appears to be closely related to *H. kivuensis* (Thiele) with which it agrees in the mantle lobes, the short amatorial gland, the general structure of the penis and in having a shell with finely spirally striate last whorl, having some coarse spiral impressions, and a smooth, not punctate first whorl. The following differences may be noted. *H. niger* is a larger animal by about a third. The sculpture of the last whorl of the shell is much stronger. The back of the foot is strongly concave under the shell. The shell-lobes of the mantle are smaller. The penial retractor muscle is inserted directly on the epiphallus.

The alcohol in which this snail was preserved was stained amber-yellow by transmitted, malachite green by reflected light. Whether due to a dye taken into solution from the mollusk is not certain.

180. **Helixarion (Angustivestis) bequaerti,** new species

Plate XXII, Figures 6 and 9

Walikale (Bequaert Coll.).

The shell (Fig. 136*a* and *b*) is fragile, antique brown, glossy. The spire is nearly level, somewhat vinaceous. The base has a "membranous" crescent around the axis. The first whorl is smooth. Last whorl has fine impressed lines, which are spiral on the inner half, but on the peripheral half and base they descend obliquely forward. The last whorl has the usual low radial waves, and under the microscope shows fine, distinct striæ parallel with them, and crossed by very fine, close spiral striæ. The aperture is subquadrate in basal view.

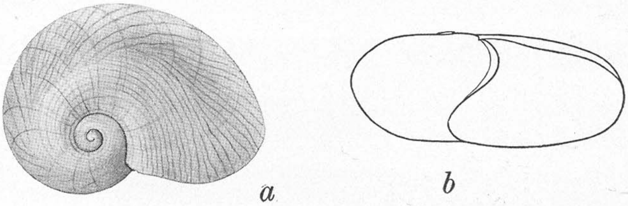

Fig. 136. *a* and *b*, *Helixarion (Angustivestis) bequaerti*, new species. Shell, ×2.

Altitude, 10.6 mm.; diameter, 23.7 mm.; 2¾ whorls.

The animal is black externally. The foot has a triangular flat area under the visceral dome, after which there is a short, blunt keel; no

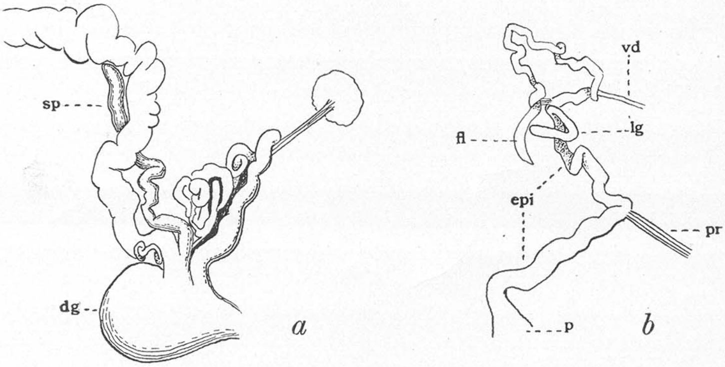

Fig. 137. *Helixarion (Angustivestis) bequaerti*, new species. *a*, general' view of the genitalia; *b*, penis and its accessories isolated and partially straightened out: dg, dart gland; epi, epiphallus; fl, flagellum; lg, lime gland; p, penis; pr, retractor of penis; sp, spermatheca; vd, vas deferens.

caudal horn over the wedge-shaped pore. The flanks have weak oblique grooves.

The shell-lobes are long and slender, tapering. Left lobe is 7 mm. long, right lobe, 9.5 mm.

Genitalia (Fig. 137*a* and *b*).—Penis is rather short and slender, not distinctly differentiated externally from the long epiphallus. There is a well-developed proximal lime gland and a long flagellum. The penial retractor is short, inserted near the base of the epiphallus. Length of penis and epiphallus, 16 mm.; of flagellum, 11.5 mm.; of penial retractor, 3.5 mm. The dart sac is very large, over 4 mm. in diameter, shortly ovate. It contains a long, thick papilla. The duct of the spermatheca is long and convoluted, the total length, 13 mm.

The pallial organs are shown in Pl. XXII, fig. 6. The kidney is very large, L-shaped; primary ureter also large. The pulmonary vein branches over the surface of the kidney. There is also an arborescent branch upon the pericardium. The large kidney and pericardium leave only a small area of the black outer wall of the lung.

By the smooth embryonic whorl, the spirally sulcate last whorl of the shell, the structure of the genitalia, and the narrow shell-lobes of the mantle this species groups with *H. kivuensis*, *H. ruwenzoriensis*, and *H. niger*. In the coarser spiral sculpture of the shell, also extending over the base, it is unlike all of them. The distance between the insertion of the retractor and the proximal lime sac is much greater in this species than in *niger* or *ruwenzoriensis* (6.5 mm., as against 1.5 mm.).

The alcohol containing this snail was stained as described under *H. niger*.

181. **Helixarion (Angustivestis) ruwenzoriensis,** new species

Plate XXII, Figure 10

Mt. Ruwenzori: western slope in the Lamia Valley at about 2000 m. (Bequaert Coll.).

The shell (Fig. 138*a* and *b*) is depressed-globose, thin, very glossy throughout,

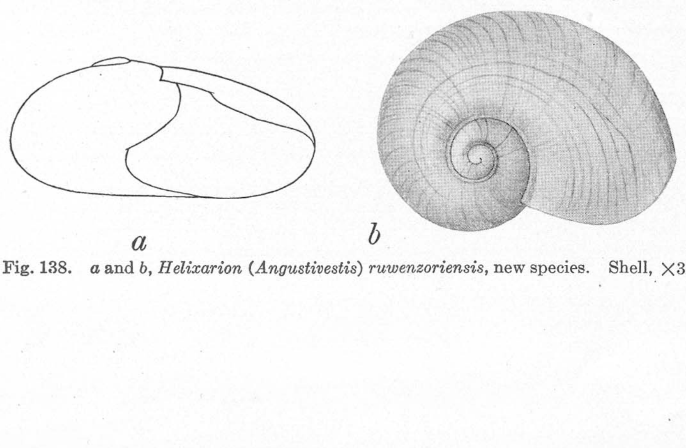

Fig. 138. *a* and *b*, *Helixarion* (*Angustivestis*) *ruwenzoriensis*, new species. Shell, ×3.

cinnamon, fading to weak olive-lake in the middle of the base (or sometimes transparent, dilute olive-lake, slightly cinnamon tinted towards the end of the last whorl); the spire having a slightly vinaceous tint. The spire projects very little. The first whorl is smooth, later ones have weak growth-lines, and a group of impressed spiral lines on the upper surface. Under the microscope the last whorl shows fine, close, raised spiral striæ over the upper and peripheral parts, becoming very faint, almost disappearing on the base. The periphery is well rounded throughout.

Altitude, 9 mm.; diameter, 15.5 mm.; 2¾ whorls. Another specimen has 3 whorls; diameter, 17 mm.

The mantle and foot are dark olive; flanks deeply scored by oblique grooves, about 24 on each side, granulated between the grooves. There is a short caudal horn. The foot margin is wide, with a distinct submargin.

The mantle is smooth, the body-lobes wide. The right and left shell-lobes are very long and slender. In Pl. XXII, fig. 10, the right shell-lobe is seen turned down across the foot.

Genitalia (Fig. 139).—Penis cylindric. Epiphallus long, bearing a proximal lime gland near the insertion of the retractor muscle, and a long flagellum, enlarged distally. The dart sac is subglobose. The spermatheca has a rather long duct.

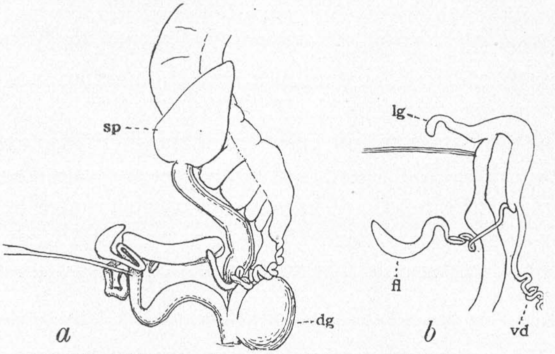

Fig. 139. *Helixarion (Angustivestis) ruwenzoriensis*, new species. *a*, general view of genitalia; *b*, epiphallus and its appendages: dg, dart gland; fl, flagellum; lg, lime gland; sp, spermatheca; vd, vas deferens.

Length of penis and epiphallus, 15 mm.; of flagellum, 14 mm. Penial retractor 7 mm. long.

The lung has pale, coarse venation on a black ground. There is no venation over the kidney.

Helixarion succulentus (v. Martens) is evidently related, but no spiral furrows on the shell are mentioned in the description of that species.

While somewhat like *H. niger,* this species is smaller, with more delicate shell, which is less coarsely sulcate spirally, and the flagellum is longer, though the animal is much smaller; the oblique grooves of the foot are more numerous, the tail without so high a keel, etc.

Helixarion kivuensis (Thiele) differs in various features of the shell, which is described as 20 mm. in diameter, dark olive-green, roundly angular on the left side, and having a somewhat matt luster above. The genitalia as figured by Thiele show much similarity, though without measurements an exact comparison cannot be made. In the Ruwenzori species I could find no trace of "einem Knick des ♂ Kopulationsorgan, das am Ende etwas verdickt ist," upon which the penial retractor is inserted.

182. **Helixarion** (?) **microgranulatus** (Preston)

Africarion microgranulata PRESTON, 1912, Proc. Zool. Soc. London, p. 184, Pl. XXXI, figs. 5 and 5*a*. (Type locality: Kigezi, at 6000 ft., extreme S. W. Uganda).

Mukule at about 1800-2000 m. (Bequaert Coll.).

With some misgivings I refer to this species, described from a place not far away, some specimens which agree in the main with the description, but are somewhat larger. The embryonic whorls are smooth (a character not mentioned in Preston's account). The last whorl has some fine, weak plication, and under the microscope shows striation along growth lines and very close spiral striation.

Altitude, 8 mm.; diameter, 13.7 mm.; slightly more than 3 whorls.

GYMNARION, new genus

Helixarionid snails having minute, remote right and left shell-lobes. Penis with subterminal retractor muscle and epiphallus, the latter without flagellum or other appendages. A long, club-shaped dart sac (amatorial gland) is present.

Type: *Helicarion aloysii-sabaudiæ* Pollonera.

By its simplified male organs this group resembles *Africarion,* but it is far less advanced in structure of the mantle. The insignificant shell-lobes are scarcely noticeable, being vestigial structures in this genus. The protective function of the shell remains important.

The dart sac has the lengthened shape prevalent in genera of the Oriental Region—*Austenia, Cryptosoma,* and *Girasia*—and unlike other African genera. It is not a muscular organ, having soft thick glandular walls and no dart papilla. Several opened contained no dart; probably its function has changed.

Since the West African *Helixarion sowerbyanus* (Pfeiffer) is very close to *H. aloysii-sabaudiæ* in shell characters, it is probably a *Gymnarion.*

183. **Gymnarion aloysii-sabaudiæ** (Pollonera)

Plate XXII, Figures 8 and 8*a*

Helicarion sowerbyanus Pfeiffer (?). E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 36, Pl. I, figs. 6 and 6*a*.

Helicarion aloysii-sabaudiæ POLLONERA, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 538, p. 1 (type locality: Bujongolo on the eastern slope of Mt. Ruwenzori in the Mobuku Valley at 3500-4000 m.); 1909, Il Ruwenzori, Parte Scientif., I, p. 193, Pl. XIX, figs. 15 and 16; Pl. XX, fig. 8. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 198.

On the Upper Ituri (Stuhlmann Coll.). At the western foot of Mt. Ruwenzori, in the forest N. W. of Beni, on the Upper Ituri, and near Avakubi (Schubotz Coll.).

Stanleyville, Medje (Lang and Chapin Coll.); Bomili, Avakubi, Kilo, Lesse (Bequaert Coll.).

"This large russet-shelled species is much rarer at Medje than the smaller *Helixarion entagaricus;* it crawls on the low vegetation in moist second growth fairly close to the ground, where little light can penetrate" [H. L.].

This is an abundant snail along the Ituri River and its tributaries, and also in the Semliki Forest. A comparison of specimens shows that it is certainly distinct by characters of the shell from the West African species *sowerbyanus* (Pfeiffer), with which v. Martens, not without doubt, identified specimens from the Upper Ituri. Pollonera surmised that these specimens were really his *H. aloysii-sabaudiæ,* and there can be little doubt that he is right.

The large, depressed, thin shell varies from buffy citrine to russet above, matt, irregularly and coarsely plicate. Beneath it is lighter, greener and glossy. The embryonic shell, of 1½ whorls, has distinct punctate spirals and weak radial striæ. The last whorl is very densely, microscopically granulose above and over the periphery, the base showing a matt band around the periphery enclosing a median glossy area. A large specimen has a diameter of 31 mm.

The foot and mantle are smoke-gray, usually maculated sparsely with darker gray spots in the Medje specimens. In one from Kilo and those from Avakubi the mantle is profusely maculate with black, also on the part concealed by the shell. In one from Lesse there are no spots.

The foot has oblique lines on the flanks, and a small tail horn above the long caudal slit, which is dilated above. In some individuals which had evidently been drowned, the foot is 60 mm. long. Ordinary alcoholic specimens such as those figured are about two-thirds that length.

The mantle is weakly, finely granulose. The body-lobes are not very broad, except in front. There are very small, narrow right and left shell-lobes, the right one more slender. The left shell-lobe is 4 mm. long.

Genitalia (Fig. 140).—The penis has a swollen apex, and a very long, slender apical retractor muscle. The epiphallus is long, without appendages. The dart sac is long and club-shaped. The uterus is very voluminous.

Length of penis, 5.5 mm.; of dart sac, 5.5 mm.; length of spermatheca and its duct, 10 mm.

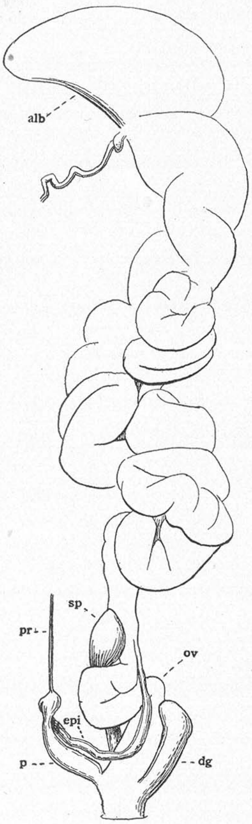

Fig. 140. Genitalia of *Gymnarion aloysii-sabaudiæ* (Pollonera): alb, albumen gland; dg, dart gland; epi, epiphallus; p, penis; pr, retractor of penis; sp, spermatheca; ov, oviduct.

184. **Gymnarion medjensis,** new species

Ituri Forest: Medje, very abundant (Lang and Chapin Coll.).

The shell (Fig. 141*b*) is depressed-globose, very thin, yellow, the last whorl rather finely plicate radially above; under the microscope covered with an excessively minute granulation over the upper and peripheral parts, which have a somewhat silky luster, the middle field of the base being glossy. There are no puncture-lines on the glossy early whorls.

Altitude, about 7.5 mm.; diameter, 11.5 mm.; 2½ whorls.

The foot and mantle are chamois colored. The foot is slightly flattened under the shell, then subcarinate, terminating in a short horn. In a drowned specimen it is about 25 mm. long.

The right shell-lobe of the mantle is small, triangular, about 3 mm. long, its basal width about the same. The left lobe is similar, a little smaller (Fig. 142*b* and *c*).

Genitalia (Fig. 142*a*).—The penis is 6 mm. long, stout, contracted near the end, where the retractor muscle and epiphallus are inserted. The "dart sac" is a broad gland, 5 mm. long. The female organs are sufficiently shown in the figure.

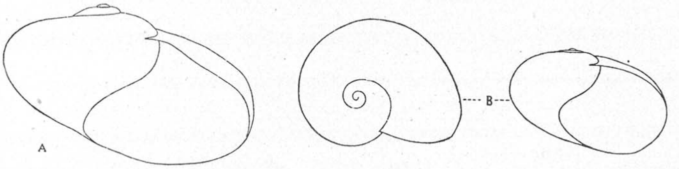

Fig. 141. *Gymnarion medjensis*, new species. *a*, shell from Bogoro; *b*, shell from Medje, type.

In a specimen from Bogoro, collected by Bequaert, the shell (Fig. 141*a*) is somewhat larger. Altitude, 9.5 mm.; diameter, 15 mm.; 2½ whorls; olive-buff, the first whorl cinnamon-buff. The granulation of the last whorl is more effaced, though visible in places, under a high power. As in the type lot, the tenuity of the shell is remarkable, but when dried it does not collapse.

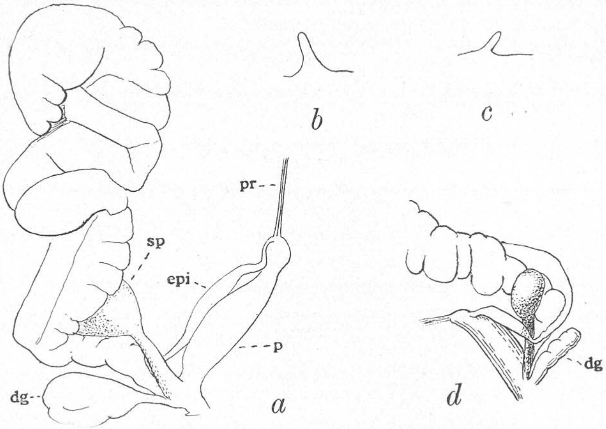

Fig. 142. *Gymnarion medjensis*, new species. *a*, genitalia of the type; *b* and *c*, right and left shell-lobes and *d*, genitalia of specimen from Bogoro: dg, dart gland; epi, epiphallus; p, penis; pr, penial retractor; sp, spermatheca.

The animal is colored as above described. Shell-lobes very small, narrower than in the type of *medjensis*, being almost finger-shaped, but little wider below. The right lobe is 3 mm. long, the left slightly smaller. The genitalia do not differ materially. The dart sac is narrower. Penis, 3.7 mm. long (Fig. 142*d*).

Other Helixarioninæ Recorded from the Belgian Congo

As the generic position of most of these forms is uncertain, no revision of the nomenclature is attempted.

Helicarion (?) *capelloi* Furtado

Helicarion (?) *capelloi* Furtado, 1886, Journ. de Conchyl., XXXIV, p. 141, Pl. vi, fig. 1.

Type locality: on the Luapula River (Capello and Ivens Coll.).

Africarion copiosus Preston

Africarion copiosa Preston, 1914, Proc. Zool. Soc. London, p. 788, Pl. ii, fig. 13.

Type locality: Burunga at the foot of Mt. Mikeno, at 6000 feet (Kemp Coll.).

Helicarion issangoensis Thiele

Helicarion cailliaudi E. v. MARTENS, partly, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 37, Pl. III, fig. 2; not Pl. I, fig. 4, nor the specimens from Mt. Ruwenzori, which are *Helicarion succulentus* v. Martens, according to Thiele.

Helicarion issangoensis J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 195, fig. xix; Pl VI, fig. 66.

Semliki Valley: at the ferry of the Semliki River (=Issango), 0° 49′ N. lat., and Karevia at the western foot of Mt. Ruwenzori, 1300 m. (Stuhlmann Coll.); type locality not designated.

Helicarion kivuensis Thiele

Helicarion kivuensis J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 192, fig. xiv; Pl. V, fig. 34; Pl. VI, fig. 60.

Kwidjwi Island, 2100 m. (Schubotz Coll.); forest 90 kilom. west of the southern shore of Lake Albert Edward (Grauer Coll.); Thiele refers to this with doubt specimens from the western foot of Mt. Ruwenzori and from Mt. Ninangongo at 3000 m. (Schubotz Coll.); he records it also from the Rugege Forest at 1800-2000 m. No type locality is designated.

The species described above as *Helixarion* (*Angustivestis*) *niger* comes very close to this.

Helicarion membranaceus Thiele

Helicarion membranaceus J. THIELE, 1911. Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 199.

Type locality: Ituri Forest between Irumu (misspelled Iruma) and Mawambi (Schubotz Coll.).

Helicarion perfragilis Preston

Helicarion perfragilis PRESTON, 1910, Ann. Mag. Nat. Hist., (8) VI, p. 58, Pl. IV, fig. 1.

Type locality: Maringo Plateaux (? Marungu), Belgian Congo (? Coll.).

Helicarion schubotzi Thiele

Helicarion schubotzi J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 193, figs. xvii and xviii; Pl. VI, figs. 62, 63, and 65.

Kwidjwi Island and southeastern shore of Lake Kivu (Schubotz Coll.); Rugege Forest at 2100 m. and forest 90 kilom. west of the southern shore of Lake Albert Edward (Grauer Coll.). Type locality not designated.

Helicarion sowerbyanus (Pfeiffer)

Vitrina sowerbyana PFEIFFER, 1848, Proc. Zool. Soc. London, p. 107; type locality West Africa.

Helicarion (*Africarion*) *sowerbyi* Pfeiffer. GERMAIN, 1911, Bull. Mus. Hist. Nat. Paris, pp. 220 and 233, fig. 49. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 13.

Kisantu (Bequaert Coll.). One of these specimens proved upon comparison to be the true West African *H. sowerbyanus*.

Africarion spatiosus Preston

Africarion spatiosus PRESTON, 1914, Proc. Zool. Soc. London, p. 789, Pl. II, fig. 17.
Type locality: Burunga at the foot of Mt. Mikeno, at 6000 feet (Kemp Coll.).

Helicarion stuhlmanni v. Martens

Helicarion stuhlmanni E. v. MARTENS, 1895, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 123; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 37, Pl. III, fig. 1. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 194, Pl. VI, figs. 64 and 64*a*.

Mt. Ruwenzori: western slope in the bamboo forest of the Butagu Valley at 2600 m. (type locality; Stuhlmann Coll.). Kwidjwi Island, southeastern shore of Lake Kivu, Beni, and western slope of Mt. Ruwenzori at 2000-3000 m. (Schubotz Coll.). Probably also specimens from Migere in Butumbi (Stuhlmann Coll.) and from between Irumu and Mawambi, the Upper Ituri, and Kisenje (Schubotz Coll.).

Helicarion subangulatus v. Martens

Helicarion subangulatus E. v. MARTENS, 1895, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 124; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 39, Pl. I, figs. 3 and 5; Pl. III, fig. 6. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 196, figs. xx and xxi.

Type locality: Bukende in the Semliki Valley (Stuhlmann Coll.); thus given by v. Martens, 1895; in v. Martens, 1897, the only locality recorded is Bundeko, which is practically situated on the same spot as can be seen from our map.

Helicarion succulentus v. Martens

Helicarion succulentus E. v. MARTENS, 1895, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 123; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 38, Pl. III, fig. 3. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, pp. 190 and 195, Pl. VI, fig. 61.

Helicarion cailliaudi E. v. MARTENS, partly, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 37, Pl. I, fig. 4; not Pl. III, fig. 2, nor the specimens from the Semliki ferry and from Karevia which are *H. issangoensis* Thiele.

Type locality: Mt. Ruwenzori, western slope in the bamboo forest of the Butagu Valley at 2600 m. (Stuhlmann Coll.).

Africarion tenebrosus Preston

Africarion tenebrosa PRESTON, 1914, Proc. Zool. Soc. London, p. 789, Pl. II, fig. 19.
Type locality: Burunga at the foot of Mt. Mikeno at 6000 feet (Kemp Coll.).

Helicarion welwitschii (Morelet)

Vitrina welwitschii A. MORELET, 1868, Voy. Welwitsch, Moll. terr. et fluv., p. 51, Pl. I, fig. 9 (type locality: on rocks of the presidio of Pungo Andongo, Angola).

Helicarion welwitschi Morelet. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 198.

Fifty kilometers east of Kasongo in the forest (Grauer Coll.).

In addition the following species are likely to occur also in the territory of the Belgian Congo:

Africarion concavospira PRESTON, 1914, Proc. Zool. Soc. London, p. 787, Pl. II, fig. 20. Type locality: Kiduha, Lake Mutanda, extreme S. W. Uganda.

Africarion kiduhaënsis PRESTON, 1914, Proc. Zool. Soc. London, p. 788, Pl. II, fig. 16. Type locality: Kiduha, Lake Mutanda, extreme S. W. Uganda.

Africarion microstriata PRESTON, 1912, Proc. Zool. Soc. London, p. 184, Pl. XXXI, figs. 4 and 4*a*. Type locality: between Mbarara and Kigezi, extreme S. W. Uganda.

Africarion oscitans PRESTON, 1912, Proc. Zool. Soc. London, p. 788, Pl. II, fig. 4. Type locality: Lake Mutanda, extreme S. W. Uganda.

Helicarion roubaudi GERMAIN, 1909, Bull. Mus. Hist. Nat. Paris, p. 539, fig. 39. Type locality: Brazzaville.

Helicarion tanganyicæ E. v. MARTENS, 1895, Nachrichtsbl. D. Malak. Ges., XXVII, p. 178; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 36, Pl. III, fig. 5. Type locality: near Lake Tanganyika; this snail was collected by P. Reichard and might have come from the western shore.

Vitrininæ

Zonitidæ having a fragile, depressed shell of very few whorls, no caudal pore and no epiphallus; mantle extended somewhat in front of the shell.

VITRINA Draparnaud

Vitrina DRAPARNAUD, 1801, Tabl. Moll. Terr. France, pp. 33 and 98; for *Helix pellucida* Müller.

The tropical *Vitrinæ*, at least as represented by *V. oleosa* v. Martens, differ in several respects from the holarctic forms of the genus. The shell has none of the punctation of the first whorl which makes the typical species beautiful objects under the microscope. The mantle has no shell-lobes, or if present they are so small that they disappear by contraction in alcohol. The marginal teeth all have simple, thorn-like cusps, not bifid as part of them are in typical *Vitrina*. For this group I propose the subgeneric name *Calidivitrina*, with *V. oleosa* as type.

CALIDIVITRINA, new subgenus

185. **Vitrina (Calidivitrina) oleosa** v. Martens

Vitrina oleosa v. MARTENS, 1895, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 124; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 40, Pl. III, fig. 4. E. A. SMITH, 1909, Trans. Zool. Soc. London, XIX, p. 43. POLLONERA, 1909, Il Ruwenzori, Parte Scientif., I, p. 193.

Vitrina cagnii Pollonera, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 538, p. 1; 1909, Il Ruwenzori, Parte Scientif., I, p. 193, Pl. xix, figs. 12-14 (type locality: Mt Ruwenzori, on the eastern slope at the glacier of the Mobuku River, at 4000-5000 m.).

Mt. Ruwenzori: western slope in the Butagu Valley at 4063 and 3557 m. (type locality; Stuhlmann Coll.). Smith and Pollonera record it from the eastern slope near the glacier of the Mobuku River at 4000-5000 m.

Mt. Ruwenzori: western slope at about 4500 m. in the upper Butagu Valley (Bequaert Coll.).

"Of all the mollusks from Mt. Ruwenzori this species reaches the highest altitude; it is still found at the line of perpetual snow where I collected several specimens of it on April 23, 1914. It is fairly abundant in the alpine region (between 4000 and 4500 m.) where it can be seen crawling over the leaves of the giant lobelias and tree-Senecios; many were found hidden in the leaf sheaths of *Senecio adnivalis* Stapf" [J. B.].

The colored cuticle and rather large spire of the shell, and the absence of any spiral striation are characteristic. The embryonic whorl has no microscopic punctation, such as the northern *Vitrinæ* possess. Altitude, 5½ mm.; diameter, 10 mm.; nearly three whorls (Fig. 143*a* and *b*).

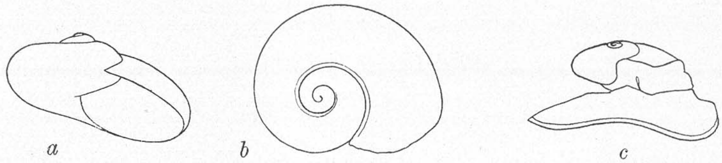

Fig. 143. *Vitrina* (*Calidivitrina*) *oleosa* v. Martens: shell, × 2½ (*a* and *b*) and right side of animal (*c*).

The foot and mantle are dirty chamois with some indistinct gray marbling; eye tentacles dusky. The tail tapers to the end, which has no caudal pore. The sole is tripartite (Fig. 143*c*).

The mantle is situated rather anterior of the middle. It projects but little in front of the shell. There are no shell-lobes, or possibly a very slight projection behind the angle of the aperture might be considered a vestigial right lobe.

Genitalia (Fig. 144*c*).—The large penis has terminal retractor and vas deferens. It is 4 mm. long. The base of the spermatheca duct is somewhat swollen, but there is no trace of a dart sac. The base of the oviduct is concealed in the figure.

The jaw (Fig. 144*b*) is smooth anteriorly, with a prominent median projection of the cutting edge. The teeth (Fig. 144*a*) have bicuspid centrals, the mesocone long. Laterals with similar long mesocones, but no entocones. There are about 3 teeth (10th to 12th) making the transition to the marginal type, the 12th tooth being the last having an ectocone. The marginal teeth are all of the simplest thorn-like form. They are very numerous, and diminish gradually to the edge. The central with two lateral teeth and the 22d marginal are figured.

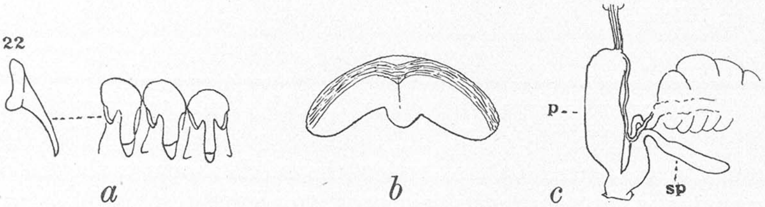

Fig. 144. *Vitrina (Calidivitrina) oleosa* v. Martens: *a*, teeth; *b*, jaw; *c*, terminal ducts of genitalia: p, penis; sp, spermatheca.

This tropical mountain species differs from the typical holarctic *Vitrinæ* by having no punctures on the first whorl of the shell, and by the very much less extensive mantle, which appears to be situated more anteriorly on the foot. Also, the marginal teeth are all strictly unicuspid, while in northern *Vitrinæ* they have bifid points, at least in part.

Other Species of *Vitrina* Recorded from the Belgian Congo

The following two species are the only ones of which the animal has been studied, and which therefore undoubtedly are Vitrininæ:

Vitrina bambuseti Thiele

Vitrina bambuseti Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 188, Pl. v, figs. 32 and 32*a*.

Type locality: Mt. Sabinyo at 3000 m. in the bamboo forest (Schubotz Coll.).

Vitrina tenuissima Thiele

Vitrina tenuissima J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 188, Pl. v, figs. 33 and 33*a*.

Type locality: Mt. Karisimbi at 3400-4200 m. on the leaves of a *Senecio* (Schubotz Coll.).

The following three species have been described on empty shells and possibly belong to the Helixarioninæ:

Vitrina bozasi A. T. de Rochebrune and Germain, 1904, Bull. Mus. Hist. Nat. Paris, p. 143; 1904, Mém. Soc. Zool. France, XVII, p. 21, Pl. i, figs. 10 and 11. Type locality: banks of the Uele River (du Bourg de Bozas Coll.).

Vitrina compacta Preston, 1912, Proc. Zool. Soc. London, p. 184, Pl. xxxii, fig. 11. Type locality: between Mbarara and Kigezi, extreme S. W. Uganda.

Vitrina ibandensis POLLONERA, 1907, Boll. Mus. Zool. Anat. Comp. Torino, XXII, No. 561, p. 1; 1909, Il Ruwenzori, Parte Scientif., I, p. 194, Pl. XIX, figs. 17 and 18. Type locality: Mt. Ruwenzori: eastern slope in the Mobuku Valley at Ibanda, 1600 m.

Sitalinæ

Minute zonitid snails having a caudal gland, the mantle lobes scarcely noticeable, the shell thin, conic or pyramidal, capable of containing the soft parts. Lateral teeth of the radula similar to the centrals, tricuspid, the entocone being developed; marginal teeth bifid or trifid.

This group was instituted by Godwin-Austen to make a place for such genera as *Kaliella*, *Sitala*, and *Guppya*, which cannot properly be put in any of the other subfamilies.

KALIELLA W. T. Blanford

Kaliella W. T. BLANFORD, 1863, Ann. Mag. Nat. Hist., (3) XI, p. 83; as a subgenus of *Nanina* for *Helix fastigiata* Hutton, *H. barrakporensis* Pfeiffer, and *H. aspirans* W. and H. Blanford. GODWIN-AUSTEN, 1882, Land and Freshwater Mollusca India, I, p. 1; *Helix barrakporensis* Pfeiffer selected as type. W. T. BLANFORD AND GODWIN-AUSTEN, 1908, Fauna of Brit. India, Mollusca, Testacell. and Zonit., p. 257 (as a genus).

"Shell narrowly perforate or imperforate, conical and, when typical, trochiform, small, thin, horny, as a rule obliquely subcostulate or striated, and not spirally above; whorls increasing slowly, the last very little larger; peristome thin.

"The animal of only one species, *K. barrakporensis*, is known and this very imperfectly. It is much like that of *Sitala*, and has a distinct caudal gland with a lobe above it. There is, however, no dart-sac, and there is a pear-shaped kalc-sac at the junction of the vas deferens with the penis; no cæcum leads to the retractor muscle, which is attached to a fold. The spermatheca has not been described. The radula differs from that of *Sitala* in the small number of teeth in each row (67 in *K. barrakporensis*) and in the larger number of broad admedian teeth."[1]

Type: *Helix barrakporensis* Pfeiffer.

This genus is typically Indo-Malayan; one of the common Indian species has spread into Madagascar (where it might be indigenous) and into East, South, and Central Africa; in many of its African localities it has possibly been introduced by man. Preston has described in later years several African snails which he refers to this genus; but the animal and soft anatomy of these forms being totally unknown it is by no means certain that they are correctly placed in *Kaliella.*

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[1] W. T. Blanford and Godwin-Austen, 1908, *loc. cit.*

186. **Kaliella barrakporensis** (Pfeiffer)

Helix barrakporensis PFEIFFER, 1852, Proc. Zool. Soc. London, p. 156 (type locality: Barrakpore, British India).

Kaliella barrakporensis Pfeiffer. GODWIN-AUSTEN, 1882, Land and Freshwater Mollusca India, I, pp. 2 and 19; Pl. I, figs. 1-3*b*; Pl. II, fig. 1; Pl. V, figs. 3 and 11. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 17. Lukonzolwa (Bequaert Coll.).

Ituri Forest: Medje (Lang and Chapin Coll.). Semliki Forest: Lesse. Mt. Ruwenzori: on the western slope in the Butagu Valley at 2200 m. Mukule at 1800-2000 m. Mbisi near Masisi (Bequaert Coll.).

This species is very common in British India; it has been found on Madagascar and in South Africa, and appears to be widely spread in East Africa. The synonyms and references have been compiled by Dautzenberg and Germain. Connolly,[1] following Godwin-Austen, records at least part of the South African forms as *K. sigurensis* Godwin-Austen; but intermediate forms have been noted.[2] Probably *K. victoriæ* Preston,[3] of which I have examined topotypes, is only a variety differing by the more distinct sculpture.

187. **Kaliella iredalei** Preston (?)

Kaliella iredalei PRESTON, 1912, Proc. Zool. Soc. London, p. 187, Pl. XXXI, fig. 12 (type locality: between the Igembi Hills and Nyeri, British East Africa).

Mt. Ruwenzori: western slope in the Lamia Valley at about 2000 m. (Bequaert Coll.).

The single specimen taken is broken, and I do not feel quite positive of the identification. By the rounded periphery, without trace of a keel it differs conspicuously from *K. barrakporensis.* The vertical lineolation also is far more minute. Length, 2.9 mm.

The following species has been found close to the boundary of the Belgian Congo:

Kaliella kigeziensis PRESTON, 1912, Proc. Zool. Soc. London, p. 187, Pl. XXXI, fig. 14. Between Mbarara and Kigezi, extreme S. W. Uganda; also at various points near Kigezi itself; type locality not designated.

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[1] 1912, Ann. South. Afr. Mus., XI, 3, p. 117.

[2] Blanford and Godwin-Austen, 1908, Fauna of Brit. India, Mollusca, Testac. and Zonit., p. 259.

[3] 1912, Ann. Mag. Nat. Hist., (8) IX, pp. 69 and 70, fig. 2; type locality: Rhodesia (Victoria Falls).

Urocyclidæ

Slugs having essentially the organization of the Helixarioninæ, that is, with a caudal gland, epiphallus, and flagellum. They differ by having the foot excavated throughout most of its length to contain the viscera, the mantle forming an oval anterior shield, which usually has a pore over the small and otherwise concealed shell; shell oval, patelliform and non-spiral.[1]

The Helixarioninæ, in various genera not directly related, show a tendency to dispense with the shell, which is reduced in size, partially uncoiled, or partially uncalcified, and more or less covered by lobes of the mantle. In the Urocyclids this tendency has reached its culmination. Except by continued degeneration of the shell it can go no further. The external form has become that of Limacidæ and Arionidæ.

It is only because of this conformity to the ideal slug form that the group can be separated from the Helixarioninæ. And there are certain genera, such as *Leptichnus, Estria, Aspidelus,* still in suspense. Are they retarded Urocyclids? Are they Helixarionids traveling a trail parallel to that of the Urocyclids? Further study with more material—these genera are still monotypic and have been dissected but once—will no doubt answer these questions. *Leptichnus,* by having the visceral cavity anterior, not penetrating the foot back of the mantle, should belong to Helixarioninæ, the long flagellum also agreeing with that group, though also found in *Dendrolimax.* The color pattern is one common in Urocyclidæ. In *Estria* there is limited excavation of the foot, but the visceral topography appears to be chiefly helixarionid. Of *Aspidelus,* with a shell like that of *Estria,* we know scarcely anything significant.

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[1] The chief recent papers dealing with Urocyclidæ are:

Heynemann, D. F. 1906. Die geographische Verbreitung der Nacktschnecken. Abhandl. Senckenberg. Naturf. Ges., XXX, 1-2, pp. 1-92, Pls. i-ii.

Pollonera, C. 1906. Vaginulidæ e Urocyclidæ. Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 543, pp. 1-6.

1909. Molluschi. Il Ruwenzori. Parte Scientif., I, pp. 183-192, Pls. xvii to xix.

Simroth, H. 1889. Beiträge zur Kenntniss der Nacktschnecken. Nova Acta Ac. Leop. Carol. Halle, LIV, 1, pp. 1-91, Pls. i-iv.

1894. Beiträge zur Kenntnis der portugiesischen und ostafrikanischen Nacktschneckenfauna. Abhandl. Senckenberg. Naturf. Ges., XVIII, 3, pp. 289-308, Pls. i-ii.

1895. Ueber die von Herrn Dr. Stuhlmann im Inneren von Ostafrika gesammelten Nacktschnecken. Sitz. Ber. Nat. Ges. Leipzig, XIX-XXI (1892-94), pp. 51-66.

1896. Ueber bekannte und neue Urocycliden. Abhandl. Senckenberg. Naturf. Ges., XIX, 3, pp. 281-312, Pls. i-ii.

1897, *a*. Ueber verschiedene tropische Nacktschnecken. Sitz. Ber. Nat. Ges. Leipzig, XXII-XXIII (1895-96), pp. 29-32.

1897, *b*. Ueber verschiedene Nacktschnecken. Sitz. Ber. Nat.Ges Leipzig, XXII-XXIII (1895-96), pp. 140-154.

1897, *c*. Die Nacktschnecken Ost-Afrikas. Deutsch Ost Afr., IV, pp. 1-23, Pls. i-iii.

1904. Ueber die von Herrn Dr. Neumann in Abessinien gesammelten aulacopoden Nacktschnecken. Zool. Jahrb. Abt. f. System., XIX, pp. 673-726, Pls. xxxix-xlii.

1910. Lissopode Nacktschnecken von Madagaskar, den Comoren und Mauritius. Voeltzkow's Reise in Ostafrika. Wiss. Ergeon., II, 5, pp. 577-622, Pls. xxv-xxvi.

1912, *a*. Ostafrikanische Nacktschnecken. Revue Suisse de Zool., XX, pp. 31-63, Pls. iii-iv.

1912, *b*. Bronn's Klassen und Ordnungen des Tierreichs. III. Mollusca. Abt. 3.

Simroth has expressed the opinion that the Vitrinidæ, Helixarionidæ and Urocyclidæ are polyphyletic: "die Familie is keine phylogenetische Einheit, sondern eine Entwickelungstufe."[1] This may be true of the Urocyclidæ, in the sense that several helixarionid stocks evolved along parallel lines to the slug form.

Though the list of slugs from the Congo Basin is at present insignificant, it is likely that they will be found in great variety throughout the West African Rain Forest.

ATOXON Simroth

Atoxon SIMROTH, 1889, Nova Acta Ac. Leop. Carol. Halle, LIV, 1, p. 58; for *A. hildebrandti* Simroth and *A. schulzei* Simroth.

Type: *A. hildebrandti* Simroth, Somaliland.

Urocyclidæ without a dart gland. Epiphallus with well-developed lime gland and a minute, vestigial flagellum or none. Ovotestis with the posterior lobe of the liver occupying the posterior extremity of the visceral cavity.

The region between the Upper Congo and the Great Lakes appears to be inhabited by many rather feebly differentiated species and races of *Atoxon*, part of them at present not defined in comparable terms, so that identification of specimens is difficult. This condition is due to the small number of individuals serving for the description of species. In some cases the only examples were not sexually mature, and the species based upon them can hardly be recognized positively without strictly topotypic material.

188. **Atoxon brunneum** Simroth

Plate VIII, Figures 1 and 2

Atoxon brunneum SIMROTH, 1897, Deutsch Ost Afr., IV, Die Nacktschnecken, p. 8, Pl. I, fig. 3; Pl. III, fig. 2.

Type locality: in the forest at the ferry of the Semliki River, 0° 49′ N. lat. (Stuhlmann Coll.).

Mt. Ruwenzori: western slope in the Butagu Valley at 2200 m. (Bequaert Coll.).

Two specimens are figured to show the variation in color. One, Pl. VIII, fig. 2, has snuff-brown lateral bands, above the band it is pale, elsewhere marbled with lighter brown. Sides are very pale anteriorly. The sole has olive-brown side areas, and a paler central area. On the bands there are some small black spots.

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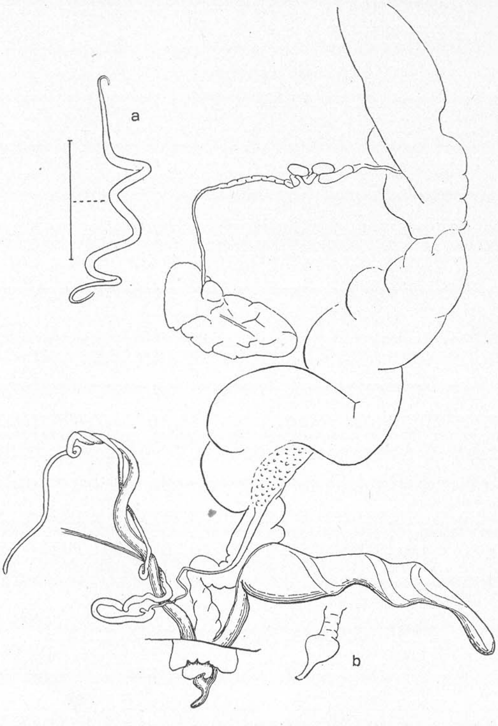
[1] 1910, Voeltzkow's Reise in Ost Afr., Wiss. Ergebn., II, 5, p. 618.

The other example, Pl. VIII, fig. 1, is olive-brown with white longitudinal grooves and a minute white reticulation. On the slightly darker lateral band there are angular black spots, in part coalescent, and a few small ones are scattered on the mantle. The pedal border and sole are clove-brown. The very long tail is a notable feature of these specimens.

Length, 45 mm.; width of sole, 6 mm.; mantle, 15 mm. long.



[Fig. 145. *Atoxon brunneum* Simroth, genitalia. The atrium and penis are exserted; *a*, a spermatophore with line indicating size; *b*, a separate view of the extended portion of penis, length, 6 mm.

In the genitalia (Fig. 145) the very long lime gland (10 mm.) and extremely small flagellum are notable The spermatheca is extremely long, 17 mm., more than twice as long as its duct, but this may be due to the two long spermatophores which it contains. The ovotestis occupies the posterior end of the visceral cavity, with the posterior lobe of the liver. The albumen gland is long and tongue-shaped.

While the specimens do not agree with *A. brunneum* in all respects, they do not appear to differ in characters of importance. *Atoxon* *ornatum* Pollonera, from Entebbe, and *A. lineatum* Simroth, from Bukoba, are somewhat similar, but the tail is shorter in both of these Lake Victoria species, and there are various differences in color, such as the dark sole of the Ruwenzori specimens. In *A. variegatum* Simroth from Kome Island in the Victoria Nyanza, the tail is far shorter, and the spermatheca globular, only half as long as its duct.

Atoxon flavum Simroth

Atoxon flavum Simroth, 1897, Deutsch Ost Afr., IV, Nacktschnecken, p. 9, Pl. i, fig. 5.

Type locality: Kishakka (Katumbaru) on the western shore of Lake Albert Edward, at 875 m. (Stuhlmann Coll.).

189. **Atoxon flavum rutshuruense,** new subspecies

Plate VIII, Figure 6

Rutshuru, in the forest gallery of the Rutshuru River (Bequaert Coll.).

This slug is chamois colored throughout. There is an oval mantle pore. Caudal horn short; an open gland pit below it. The integument is almost smooth.

Length, 30 mm.; width of sole, 3 mm.; length of mantle, 12 mm.

In the genitalia (Fig. 146) the thickening of the oviduct near its entrance into the atrium and the long spermatheca are characters like *A. flavum* Simroth, which it also resembles externally except in the absence of bands. The specimen figured is fully mature sexually, while the banded *flavum*, though larger, had the genitalia still weakly developed. The albumen gland is imperfectly cylindric with excavated distal end. The penis contains a papilla or glans, shown in dotted line in the figure. The lime gland is relatively short; flagellum minute. Length of spermatheca and duct, 11 mm.

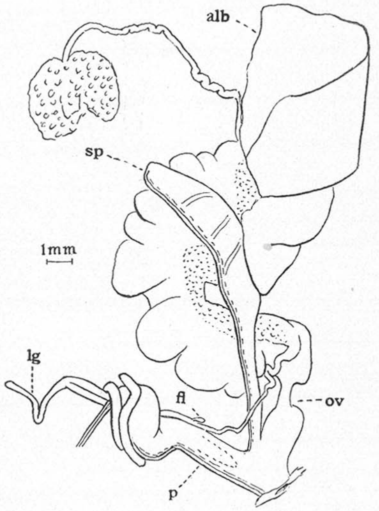


Fig. 146. Genitalia of *Atoxon flavum rutshuruense*, new subspecies: alb, albumen gland; fl, flagellum; lg, lime gland; ov, oviduct; p, penis; sp, spermatheca.

190. **Atoxon faradjense,** new species

Plate VIII, Figure 3

Faradje (Lang and Chapin Coll.).

The slug is dirty cream-buff, irregularly sprinkled with small blackish spots and dots. A faint lateral band is discernible on some specimens. The neck shows a blue spot, from the heavily pigmented eye-retractor muscles showing through. The back is angular posteriorly, rounded near the mantle. There is a small mantle pore. The integument is almost smooth, but shows faint oblique lines under close scrutiny.

Length, 40 mm.; width of sole, 4.5 mm.; length of mantle, 13 mm.

Some of the smaller specimens show pale brown lateral bands on a grayish ground, together with a sprinkling of blackish dots like the larger ones.

The retractor muscles (Fig. 147*a*) are similar in all of the genera of Urocyclidæ which I have opened. The pharyngeal and left ocular retractors diverge a little in advance of the right ocular band. All unite into a broad common band which is inserted at the posterior edge of the diaphragm, under the apical end of the shell.

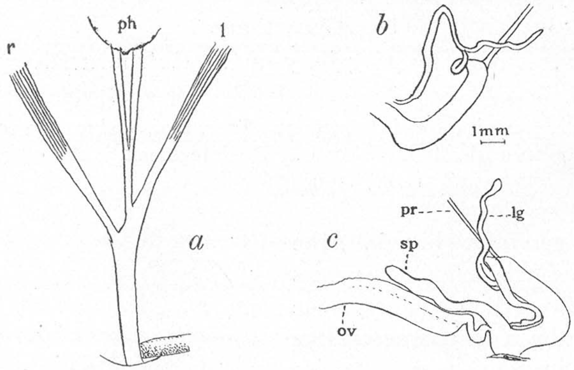


Fig. 147. *Atoxon faradjense*, new species. *a*, retractor muscles: l, left and r, right ocular retractors; ph, pharyngeal retractors; *b*, penis with the epiphallus uncoiled; *c*, genitalia: lg, lime gland; ov, oviduct; pr, penial retractor; sp, spermatheca.

Several of the largest individuals opened had the genitalia (Fig. 147*b* and *c*), especially the female organs, rather weakly developed. The epiphallus is unusually short. The lime gland is moderately long, but a flagellum is wanting, the junction of epiphallus with vas deferens being marked only by an abrupt decrease in caliber of the tube. The spermatheca is long. Female organs are slender, the specimens being in the male phase.

Other Species of *Atoxon* Recorded from the Belgian Congo

Atoxon pallens Simroth

Atoxon pallens Simroth, 1897, Deutsch Ost Afr., IV, Nachtschnecken, p. 7, Pl. I, figs. 2*A* and 2*B*.

Type locality: Kirima on the western shore of Lake Albert Edward (Stuhlmann Coll.).

Atoxon schulzei Simroth

Atoxon schulzei Simroth, 1889, Nova Act. Ac. Leop. Carol. Halle, LIV, No. 1, p. 58, Pl. III, figs. 1 and 15. 1897, Deutsch Ost Afr., IV, Nacktschnecken, p. 7, footnote.

Type locality: between Kuako and Kimpoko in the Lower Congo (Buettner Coll.). The locality was originally misspelled "Wimpoko," but this was corrected by Simroth in 1897.

Atoxon tæniatum Simroth

Atoxon tæniatum Simroth, 1897, Deutsch Ost Afr., IV, Nacktschnecken, p. 8, Pl. I, fig. 4; Pl. III, fig. 4.

Type locality: Undussuma (Stuhlmann Coll.).

DENDROLIMAX Heynemann

Dendrolimax Heynemann, 1868, Malak. Blätter, XV, p. 32; monotypic for *D. heynemanni* (Dohrn).

Urocyclidæ without a dart gland; epiphallus bearing a long lime gland and a long flagellum; ovotestis not lodged in the posterior extremity of the visceral cavity.

The distinction between *Dendrolimax* and *Atoxon* appears rather finely drawn, but *Atoxon* has a long ovotestis, lodged at the posterior extremity of the visceral cavity, and the flagellum is reduced to a minute vestige, as in most Urocyclidæ, while in *Dendrolimax* it is long, as in the Helixarioninæ.

In the single *Dendrolimax* at hand the penis and oviduct have peculiar features, described below, and the ovotestis is packed between uterus and albumen gland,—all characters unlike *Atoxon*.

191. **Dendrolimax osborni,** new species

Plate VIII, Figure 5

Rutshuru, in the forest gallery along the Rutshuru River (Bequaert Coll.).

A slug of stout figure. The back is broadly rounded behind the mantle, becoming strongly carinate near the tail. There is a blunt rounded prominence over the caudal gland, which is not conspicuous. The flanks are marked with rather deep lines, and there is a very weak reticulation over sides and mantle. Color deep neutral gray irregularly marked with rounded spots of colonial buff on the mantle and flanks.

The oblique lines are dark neutral gray. The sole and lips are chamois.

The mantle pore is about 1¾ mm. long. Inside it appears as a nearly circular pore with raised edges. The pneumostome is nearly median. The shell is thin but calcified.

Total length, about 35 mm.; width of sole, 4 mm.; length of mantle, 18 mm.; the anterior free portion 5 mm. long.

Genitalia (Fig. 148*a*, *b* and *c*).—There is a rather capacious, thin-walled penis sac enclosing a slender, long penis, doubled upon itself, as shown by lines in Fig. 148*b*. The epiphallus is not very long, bears a long lime gland and a long flagellum; near the end it is loosely attached to the penis sac. The penial retractor muscle was not seen. There is scarcely any atrium.

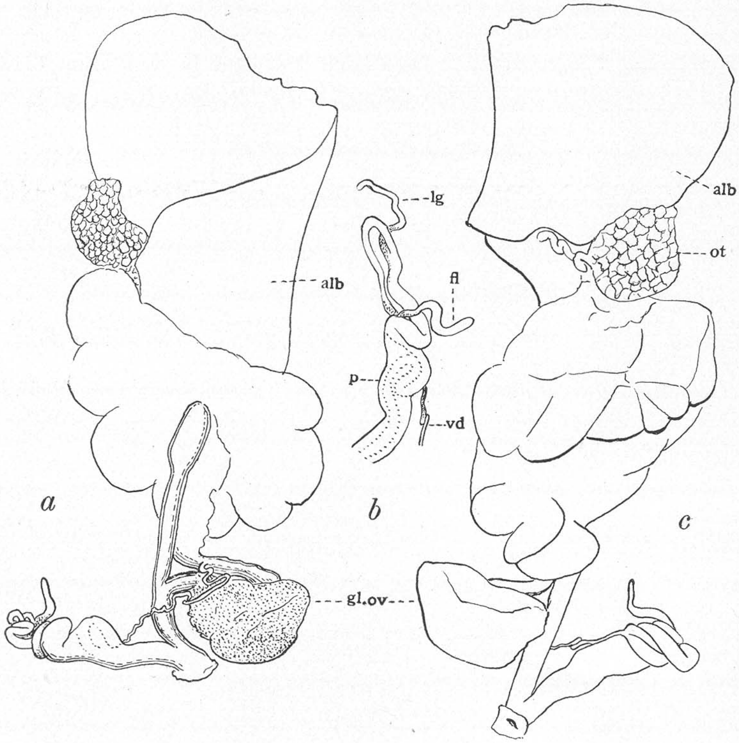


Fig. 148. *Dendrolimax osborni*, new species. *a* and *c*, two views of the genitalia; with *b*, detail of ♂ end organs, more extended: alb, albumen gland; fl, flagellum; gl.ov, glandular portion of the oviduct; lg, lime gland; ot, ovotestis; p, penis; vd, vas deferens.

The female side shows a rather long (4 mm.) vagina. Spermatheca oblong, small, enveloped by the uterus, with its duct about 6.5 mm. long.

Near its opening the oviduct abruptly enlarges into an irregular, dark brown, glandular body, the thick walls of which have large longitudinal folds within. The substance of this body has about the macroscopic appearance of the liver, and is not in the least muscular. Above it the oviduct again contracts to a cylindric white tube, then passing into the very large and sacculated uterus. The albumen gland is very large, somewhat cylindric with excavated distal end. The ovotestis is packed in between albumen gland and uterus.

This slug has some external resemblance to *D. leprosus* Pollonera,[1] but in that species the back is bluntly but strongly carinate throughout its length. Internally it differs by the short, ample atrium or atrium-like vagina, by the penis, the shape of the albumen gland and position of the ovotestis. In this connection it may be mentioned that the "*ghiandola calcare*" and the "*flagellum superiore*" of Pollonera's descriptions and figures is what is here called the flagellum, while his "*flagellum*" is herein referred to as the lime gland.

Dendrolimax continentalis Simroth is similar to *D. osborni* by the well-developed vagina, but it differs conspicuously in characters of the oviduct and penis.

It is likely that eventually *D. osborni* will be placed in a separate subgenus of *Dendrolimax*, on account of the peculiar glandular segment of the oviduct.

BUKOBIA Simroth

Stuhlmannia SIMROTH, 1895, Sitz. Ber. Nat. Ges. Leipzig, XIX-XXI (1892-94), p. 59, for *Stuhlmannia picta* Simroth (not *Stuhlmannia* Michaelsen, 1890).

Bukobia SIMROTH, 1897, Deutsch Ost Afr., IV, Nacktschnecken, p. 11; new name; monotypic for *Bukobia picta* Simroth.

Type : *Bukobia picta* Simroth.

Urocyclidæ having a dart gland at the junction of the oviduct and atrium, internally plicate or containing a fleshy papilla, but without a dart. Otherwise as in *Atoxon.*

Microcyclus Simroth has a much smaller dart gland, at the junction of the vagina and oviduct, but the distinction is of doubtful value. *Mesocyclus* Pollonera differs by the longer, club-shaped dart sac, furnished with retractor muscles.

Microcyclus modestus Pollonera and *M. incertus* Pollonera appear to me, from the descriptions and figures, to be *Bukobiæ.*

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[1] 1909, Il Ruwenzori, Parte Scientif., I, p. 189, Pl. XIX, figs. 1-5; Uganda.

192. **Bukobia cockerelli,** new species

Plate VIII, Figure 4

Mt. Ruwenzori: western slope in the Butagu Valley at 2200 m. (Bequaert Coll.).

The slug is cream color, copiously and irregularly marbled and speckled with cinnamon-brown and blackish brown. The pedal border and side areas of the sole are dark olive, the median area creamy in the middle, shading into dark olive towards the ends. The tail is attenuated behind, the caudal horn but slightly developed, the gland opening small. The back is rounded, becoming angular near the posterior end. The mantle is weakly shagreened in front, surface elsewhere nearly smooth. The oval mantle pore is 1.5 mm. long. The mucus is not coagulated as usual in alcoholic specimens, the slug remaining sticky, and in water very slippery.

Total length, 37 mm.; length of mantle, 12 mm.; 6 mm. of the mantle can be turned back.

The male genitalia (Fig. 149) have the characters usual in this genus, *Atoxon*, and others, the lime gland being long, the flagellum reduced to a minute, oval, chalk-white, vestigial gland. The subglobular dart gland, fully 3 mm. long, contained no dart. The spermatheca is long, with its duct measured to genital orifice 30 mm. It contained a spiral spermatophore. The albumen gland is long and tongue-shaped. The ovotestis occupies the posterior extremity of the visceral cavity, with the posterior lobe of the liver, as in *Atoxon*.

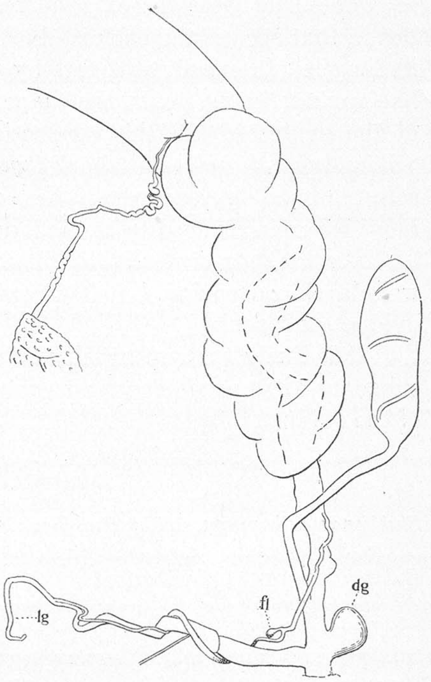

Fig. 149. Genitalia of *Bukobia cockerelli*, new species: dg, dart gland; fl, flagellum; lg, lime gland.

Named for a friend who among many scientific occupations has also studied slugs.

TRICHOTOXON Simroth

Trichotoxon SIMROTH, 1889, Nova Acta Ac. Leop. Carol. Halle, LIV, 1, p. 54, for *T. heynemanni* Simroth and *T. martensi* Simroth.

Diplotoxon SIMROTH, 1897, Sitz. Ber. Nat. Ges. Leipzig, XXII-XXIII, (1895-96), pp. 149 and 150; as a subgenus; *Trichotoxon heynemanni* Simroth, here selected as type.

Type: *T. heynemanni* Simroth.

"Urocyclidæ with a small globular [flagellum] and a tubular lime gland on the epiphallus, and with a powerful dart sac containing a number of permanent long darts."[1]

The slugs composing this strongly characterized genus are larger than those of other genera known from the region covered in this report, but their chief distinctive feature is the possession of a large dart sac with thick, muscular walls, and except in the subgenus *Atrichotoxon*, containing calcareous darts, permanently fixed, and often very long. It is the most efficient example I have seen of this mode of stimulating sexual sensation.

The subgenera of *Trichotoxon* may be arranged thus:

1. Oviduct entering at or near the distal end of the combined atrium and dart sac, which therefore serves also for the passage of eggs (Fig. 150*d*)...............2.
   Oviduct entering the atrium, that is at the middle or base of the combined atrium and dart sac (Fig. 151*a* and *b*)...............................3.
2. Four to six darts arranged by pairs in secondary sacs within the main sac. *Trichotoxon*, proper.
   Without darts............................Subgenus *Atrichotoxon* Simroth.[2]
3. Eight or more darts of slender, needle-like form..Subgenus *Polytoxon* Simroth.[3]
   One spiral dart............................Subgenus *Spirotoxon* Simroth.[4]

Spirotoxon and *Atrichotoxon* are not represented in the Congo Collection.

Subgenus **TRICHOTOXON**, proper

193. **Trichotoxon pollonerae**, new species

Plate VIII, Figure 7

Ituri Forest: Medje (Lang and Chapin Coll.).

The slug is tawny olive, clouded and maculate with dull blackish gray in very irregular pattern, the markings forming, though indistinctly, three longitudinal clouds on the mantle, two wide lateral areas and a narrow dorsal band on the back. The sole is uniform tawny olive.

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[1] Simroth, 1896, Abhandl. Senckenberg. Naturf. Ges., XIX, p. 283.

[2] 1910, Voeltzkow's Reise in Ostafrika, Wiss. Ergebn., II, 5, p. 605; as a genus; monotypic for *Atrichotoxon punctatum* Simroth, from East Africa

[3] 1897, Sitz. Ber. Nat. Ges. Leipzig, XXII-XXIII (1895-96), p. 149; as a subgenus; monotypic for *Trichotoxon aurantiacum* Simroth, from Magila near Pangani, German East Africa.

[4] 1897, Sitz. Ber. Nat. Ges. Leipzig, XXII-XXIII (1895-96), p. 149; as a genus or subgenus for *Spirotoxon elegans* Simroth, from the Kingani River near Dunde, German East Africa.

There is a very superficial tawny reticulation over the mantle, the same with weak oblique lines on the flanks. The mantle pore is small and slit-like, showing the shell. The tail is angular above, becoming keeled near the end, almost rounded near the mantle. There is a short caudal horn over the large, open, triangular pit of the caudal gland.

Length, 43 mm.; width of sole, 8 mm.; length of mantle, 16 mm.

As the specimen had been preserved in formalin, it was very hard, and the internal organs so brittle that they could not be unravelled entire. The figure (Fig. 150*d*) represents only the terminal ducts of the genitalia. It appears to be a fully adult individual. The male organs are shorter than in other *Trichotoxons* examined at this time. The lime gland is long, as usual. The combined atrium and dart gland is much like that of *T. heynemanni*. It contains two secondary sacs, each with a pair of darts. The darts (Fig. 150*a-c*) are lance-shaped, broadest at about the distal third, and 5 mm. long. The free distal third or slightly less is triangular in section, the edges obliquely grooved, intervals slightly rugose. The rest is round, with smooth, matt surface, and tapers gradually to the insertion. This end is rounded, not thickened.

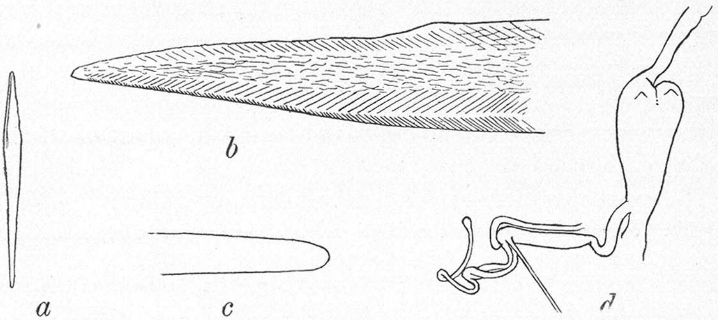

Fig. 150. *Trichotoxon pollonerœ*, new species: *a*, dart, × 6; *b*, point and *c*, attached end of dart, × 40; *d*, terminal ♂ organs and dart sac.

This species belongs to the typical group of *Trichotoxon*. *T. heynemanni* Simroth[1] is at least a third larger when adult, has much more rugose integument, and the darts are hairy. *T. conradti* Simroth[2] has not been defined satisfactorily; its locality is not near that of *T. pollonerœ*. It differs by the entirely diverse coloration, at least. *T. maculatum* Simroth[3] is a larger species without a mantle pore and having darts nearly twice as long as in *T. pollonerœ*. None of these species have the coloration of *T. pollonerœ*.

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[1] 1889, Nova Acta Ac. Leopold. Carol. Halle, LIV, 1, p. 54, Pl. III, figs. 6, 8, and 10-13; from Witu and Taita, German East Africa.

[2] 1894, Abhandl. Senckenberg. Naturf. Ges., XVIII, 3, p. 305; between Hemkole and Msassa in German East Africa; "*Trixotoxon conradti*."

[3] 1897, Deutsch Ost Afr., IV, Nacktschnecken, p. 6, Pl. I, fig. 1; Island Sesse in the Victoria Nyanza.

Trichotoxon maculatum Simroth

Trichotoxon heynemanni "oder eine nahe verwandte Art," SIMROTH, 1895, Sitz. Ber. Nat. Ges. Leipzig, XIX-XXI (1892-94), p. 53.

Trichotoxon maculatum SIMROTH, 1897, Deutsch Ost. Afr., IV, Nacktschnecken, p. 6, Pl. I, fig. 18 (type locality: Island Sesse in Lake Victoria Nyanza); 1913, Revue Suisse Zool., XX, p. 37, Pl. III, fig. 4*A*-*E*.

194. **Trichotoxon maculatum perforatum,** new subspecies

Plate VIII, Figure 9

Rutshuru (Bequaert Coll.).

The specimen drawn shows the atrium evaginated, four darts projecting They are broken at the ends. The black maculation is reduced to few small flecks in this individual, but another is marked like Simroth's figure.

The genitalia of *T. maculatum* have not been described or figured. The specimens in hand agree well with the published account of that form except that there is a small rounded mantle pore penetrating to the shell, while *maculatum* is said to have none. It may be well to designate this Rutshuru form as a subspecies. Length, 58 mm.

Subgenus **POLYTOXON** Simroth

195. **Trichotoxon (Polytoxon) ruwenzoriense,** new species

Plate VIII, Figure 8

Mt. Ruwenzori: western slope in the Lanuri Valley at 2000 m. (Bequaert Coll.).

The mantle and posterior half of the foot are Saccardo's olive; sides below the mantle creamy, shading downwards into the olive hue; lateral areas of the sole Saccardo's olive, central area buffy citrine.

The mantle is nearly smooth, but on close inspection a coarse net-work of weakly impressed lines may be seen towards the borders. There is a small, slit-like pore, about 1.5 mm. long, scarcely a millimeter from the posterior margin, and penetrating to the shell.

The foot has distinct oblique lines, and a rather finely granular surface. It is very acutely carinate dorsally; close behind the mantle the carina divides into two short, widely diverging branches, a furrow between them and the mantle. Caudal horn short. Caudal pore as usual.

Total length, 65 mm.; width of sole, 12 mm.; length of mantle, 30 mm.; posterior edge of pneumostome 19 mm. from front edge of mantle.

The shell (Fig. 151*c*) is brown, shortly oval, rather convex, having a convex, blunt mucro at the posterior end. It is marked with distinct growth-lines. Inside there is an irregular, lumpy calcareous layer over about two-thirds of its length but, except in the cavity posteriorly, it is scarcely visible except for the lumps. The remainder is cuticular. Length, 9 mm.; width, 7.7 mm.

The genitalia (Fig. 151*a* and *b*) show a short swollen penis; an extremely long epiphallus, upon which the short retractor muscle is inserted, and which is more slender beyond the insertion of the long lime gland, and coiled tendril-like about its earlier portion. The flagellum is minute, bud-like and chalky white. The spermatheca is very large, its duct inserted contiguous to the origin of the oviduct. In the enormous, bluntly terminated dart sac seven needle-shaped darts were seen. There are probably four pairs. They appear cylindric and densely pilose under the microscope.

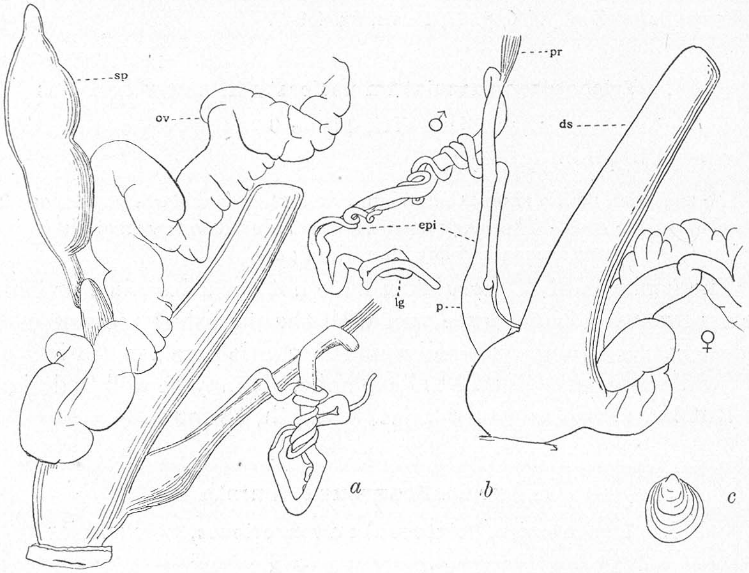

Fig. 151. *Trichotoxon (Polytoxon) ruwenzoriense*, new species: *a*, and *b*, genitalia: ds, dart sac; epi, epiphallus; lg, lime gland; ov, oviduct; p, penis; pr, penial retractor; sp, spermatheca; the flagellum is seen over the penis in fig. *b*; *c*, shell.

Length of dart sac with atrium, 25 mm.; length of a dart, about 18 mm.; length of spermatheca and its duct, 26 mm.; length of lime gland, 15 mm.

This species is to be compared with *Trichotoxon maculatum* Simroth, from Sesse Island, Lake Victoria, and *T. roccatii* Pollonera, from the eastern slope of Mt. Ruwenzori at Nakitawa. *T. maculatum* has no pore over the shell; the mantle is described as "*besonders chagrinirt.*" It is spotted with black. Finally, the four darts are scarcely 1 cm. long. The genitalia are not fully described or figured, but the differences mentioned indicate a different species.

T. roccatii[1] appears to resemble *T. ruwenzoriense* rather closely in external features, except that the tail is obtusely keeled. It has only two villose darts. The spermatheca is very much smaller than in *ruwenzoriense*, perhaps not functionally active in the individual figured. The male organs appear to be very similar.

196. **Trichotoxon (Polytoxon) pardus**, new species

Plate VIII, Figure 10

Mt. Ruwenzori: western slope in the Butagu Valley at about 2000 m. (Bequaert Coll.).

The slug is buffy brown to olive-brown, spotted with black on the flanks, the mantle marked with larger, irregular spots, many of them roughly horse-shoe shaped. The side areas of the sole are dark grayish olive, central area buffy brown.

The mantle has a very shallow polygonal reticulation. The shell pore is a short slit, as in *T. ruwenzoriense*. The back behind the mantle is acutely keeled throughout. The flanks have the usual oblique lines, between which the surface is finely, very distinctly granulous. The caudal horn is quite short.

Total length, 57 mm.; width of sole, 10 mm.; length of mantle, 25 mm.; distance of posterior edge of pneumostome from front edge of mantle, 14 mm.

The genitalia (Fig. 152) do not appear fully developed, the female organs being very slender, indicating proterandry. The male organs are formed as usual in the genus except that there is no flagellum where the epiphallus passes into the vas deferens—merely a rather abrupt contraction of the tube, as shown in the figure. The penial retractor muscle is quite long. The penis contains a papilla nearly as long as itself. The dart sac is short and thick, with the atrium 7 mm. long. It contained four darts slightly over 5 mm. long. They are of the usual needle-like shape, cylindric, and entirely smooth.

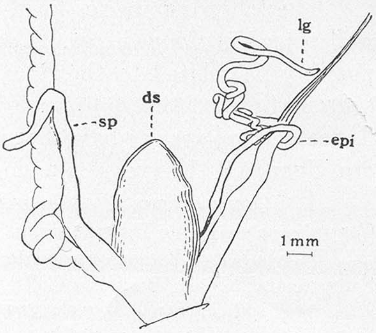

Fig. 152. Genitalia of *Trichotoxon (Polytoxon) pardus*, new species: ds, dart sac; epi, epiphallus; lg, lime gland; sp, spermatheca.

The spermatheca is slender, probably on account of immaturity or sexual inactivity.

This is the most heavily marked *Trichotoxon* described; yet as the maculation will probably be found variable in this genus, I doubt whether it is to be depended on as a specific mark. The smooth darts, short, broad dart sac, the absence of a flagellum and the long penial retractor muscle are more important characters.

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[1] Pollonera, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 543, p. 4; 1909, Il Ruwenzori, Parte Scientif., I, p. 188, Pl. xviii, figs. 14-16; Nakitawa, Mt. Ruwenzori, on the eastern slope in the Mobuku Valley.

Externally it resembles Simroth's figure of an immature slug which he refers to *T. neumanni* Simroth[1]; yet that species is described as having 18 darts, and the penis papilla or glans is much shorter than in *T. pardus.*

The following genus of Urocyclidæ has been found close to the boundary of the Belgian Congo; it occurs probably in the Lower Congo.

Buettnerella SIMROTH, 1910, Voeltkow's Reise in Ostafr. (1903-05), Wiss. Ergebn., II, 5, p. 611; new name for *Buettneria* Simroth, 1889, Nova Acta Ac. Leop. Carol. Halle, LIV, 1, p. 59; monotypic for *Buettneria leuckarti* Simroth (not *Buettneria* Karsch, 1888).

Buettnerella leuckarti (Simroth) = *Buettneria leuckarti* SIMROTH, 1889, Nova Acta Ac. Leopold. Carol. Halle, LIV, 1, p. 59, Pl. III, figs. 3, 7, and 16. Type locality: San Salvador, Wingo (Northern Angola).

Endodontidæ

GONYODISCUS Fitzinger

The following species from the Katanga region are apparently not well placed in *Gonyodiscus.* They are more like *Punctum,* or they may possibly be related to the South African *Trachycystis.* Without an examination of the radula any generic reference must be tentative. Three related species have been described by E. A. Smith from eastern Uganda.[2] I have seen none of these minute snails.

Gonyodiscus (?) *ponsonbyi* Dautzenberg and Germain

Gonyodiscus ponsonbyi DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 19.

Type locality: Kundelungu Plateau, underneath moss at about 2000 m. (between Sampwe and Kilwa; Bequaert Coll.).

Gonyodiscus (?) *smithi* Dautzenberg and Germain

Gonyodiscus smithi DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 19, Pl. I, figs. 11-13.

Type locality: Lukonzolwa (Bequaert Coll.).

Succineidæ

SUCCINEA Draparnaud

Succinea DRAPARNAUD, 1801, Tabl. Moll. France, p. 32.

The shell is ovate or oblong-ovate, imperforate, very thin and transparent, unicolorous, with a small number of whorls (3 to 4) which increase rapidly; aperture very large and oblique, ovate, occupying more than half the length of the shell; the peristome thin and simple; columella thin. The animal is large, being able to conceal itself within its shell in most species, scarcely so in others.

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[1] 1896, Abhandl. Senckenberg. Nat. Ges., XIX, 3, p. 311, fig. 8; from Kwa Kitoto, German East Africa.

[2] 1903, Journ. of Conch., X, p. 317.

The amber snails are found on aquatic plants growing near, sometimes in the water, or in humid places on high ground; a few species are adapted to arid situations. The shells of *Succinea* are so similar on all the continents that the affinities of the African forms can only be determined by a comparative study of the anatomy.

197. **Succinea congoensis,** new species

Plate XXIII, Figure 12

Zambi, 9 specimens, type locality; Thysville, 1 specimen (Lang and Chapin Coll.).

The shell is ovate, of a dull, slightly transparent naples yellow tint, irregularly marked with growth-wrinkles, usually fine but in some places coarse. The whorls are very convex, united by a deep suture. The last whorl is most convex in the middle but also convex above. The aperture is ovate, oblique, the inner and outer border being about equally curved.

Length, 8.3 mm.; diameter, 5 mm.; longest axis of aperture, 5.6 mm.; its width, 3.7 mm.; 3¼ whorls.

The largest shell is 9 mm. long.

This species is more lengthened than *S. spurca* Gould,[1] or *S. concisa* Morelet. It has the last whorl shorter and more convex than *S. badia* Morelet,[2] which is also larger, and, at least typically, of darker color.

198. **Succinea lessensis,** new species

Plate XXIII, Figure 11

Lesse, 5 specimens, in swampy forest near the Semliki River (Bequaert Coll.).

The shell is long-ovate, very thin and fragile, marguerite yellow, slightly glossy. Sculpture of rather coarse growth-wrinkles, and under the microscope a close, low granulation; on the penult whorl there are also impressed spiral striæ, rather indistinct. The first whorl is strongly convex, the last very weakly so in the upper part. The very deeply impressed suture is strongly oblique. Aperture long-ovate; columellar margin thin.

Length, 11 mm.; diameter, 6.3 mm.; longest axis of aperture, 8.6 mm.; its width, 5 mm.; 2¾ whorls.

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[1] 1850, Proc. Boston Soc. Nat. Hist., III, p. 193; Liberia.

[2] 1868, Voy. Welwitsch, Moll. terr. et fluv., p. 54, Pl. I, fig. 4; islands of Lake Calemba, Angola.

This may possibly be *Succinea princei* Preston,[1] but as that is said to be "polished, smooth but for lines of growth," I presume that it is different, as the present form is conspicuously wrinkled and distinctly granulose.

199. **Succinea bequaerti,** new species

Plate XXIII, Figure 10

Kabare, on the southern shore of Lake Albert Edward, 3 specimens (Bequaert Coll.).

The shell is very slender, fragile, marguerite yellow, with but little gloss. Sculpture of rather coarse growth-wrinkles, and a microscopic granulation throughout, with weak spirals traceable on the penult whorl, as described for *S. lessensis.* The whorls revolve very obliquely, the last being very slightly convex above, the rest strongly convex. Suture deep. The aperture is long-ovate, the parietal margin straight; columella thin.

Length, 11 mm.; diameter, 5.2 mm.; longest axis of aperture, 7 mm.; its width, 4 mm.; fully 3 whorls.

This is more slender than any African species known to me unless it be *Succinea delalandii* Pfeiffer,[2] which has a far shorter spire and longer aperture, besides differing in surface sculpture. It is most closely related to *S. lessensis,* which differs by its width, contour, and larger aperture.

Other Species of *Succinea* Recorded from the Belgian Congo

Succinea baumanni Sturany

Succinea baumanni Sturany, 1894, in O. Baumann, Durch Massailand zur Nilquelle, p. 313, Pl. xxiv, figs. 1, 6, 11, 15, 20, 21, and 26 (described from the Nyarasa-steppe and the region of the sources of the Kagera River, German East Africa; type locality not designated). E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 132, Pl. v, fig. 35. Dautzenberg and Germain, 1914, Rev. Zool. Afric., IV, p. 38.

Lukonzolwa (on the shore of Lake Moero), Nyangwe (Bequaert Coll.).

Succinea concisa Morelet

Succinea concisa Morelet, 1848, Rev. Zoolog., XI, p. 351; Séries Conchyliol., I, p. 11, Pl. iii, fig. 7 (type locality: along the River Gaboon). C. R. Bœttger, 1913, Ann. Soc. Malacol. Belgique, XLVII (1912), p. 97.

Netona (Povo Netonna) on the Banana Creek (Hesse Coll.).

This species is probably, as Ancey has stated, identical with *S. spurca* Gould, described from Liberia. The form reported by C. R. Bœttger should be compared with *S. congoensis.*

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[1] 1912, Proc. Zool. Soc. London, p. 189, Pl. xxxii, figs. 3 and 3*a*; Nakuru, British East Africa.

[2] 1851, Zeitschr. f. Malak., VIII, p. 28; South Africa from Cape Town to British Bechuanaland and Transvaal.

Succinea pseudomalonyx Dupuis and Putzeys

Succinea pseudomalonyx DUPUIS AND PUTZEYS, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. liv, figs. 25 and 26 (with description of the animal).

Type locality: Mwana Milongo[1] (Milobo, on the Lualaba in the Manyema District; Dupuis Coll.).

The authors say that this species was very abundant on the high herbs of a swamp; during the hot hours of the day it hides between the stem and the base of the leaf, close to the leaf sheath, which location makes it very hard to find.

Enidæ

(BULIMINIDÆ of authors)

The shell is bulimoid, from ovate to cylindric or turrited, perforate; the aperture ovate, higher than wide, the columella not truncated, its edge reflexed. Aulacognathous, herbivorous snails, with radular teeth of the "quadrate" type. Penis having a well-developed appendix. The Enidæ belong with regard to the structure of the pallial organs to that group of Monotremata which I have called Orthurethra,[2] the ureter passing directly forward from the kidney, as in figure 154.

The shell is conspicuously unlike other families of Orthurethra except the Partulidæ, which differ by the absence of penial accessories.

Several of the African species formerly included in *Buliminus* have proved, on examination of the animal, to be achatinid snails. Some species of v. Martens' *Buliminus abessynicus*-group[3] are in that case. They possess all the characters of *Pseudoglessula* O. Bœttger (see p. 147), including the strongly sculptured embryonic whorls and the straight or slightly reflexed peristome, which is not or but faintly thickened.[4]

RACHIS Albers

Rachis ALBERS, 1850, Die Heliceen, p. 182; as a subgenus of *Bulimus* to include several species, among them *Bulimus ferussaci* Dunker which is now synonymized with *Bulimus punctatus* Anton; no type is designated. H. AND A. ADAMS, 1855, Gen. of Recent Moll., II, p. 160; as a subgenus of *Bulimulus* (no type designated).

Rhachis L. PFEIFFER, 1855, Malak. Blätter, II, p. 161; as a subgenus of *Bulimus;* no type is designated, but among the species included are *ferussaci* Dunker and *punctatus* Anton. E. v. MARTENS, 1860, Die Heliceen, p. 230; as a subgenus of *Buliminus* with *Buliminus punctatus* Anton designated as type.

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[1] This locality is on the right bank of the Congo River, half-way between Nyangwe and Kasongo.

[2] Pilsbry. 1910, Man. of Conch., (2) XX, p vii.

[3] 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 60.

[4] *Ena kivuensis* Preston is probably a *Pseudoglessula,* as has been suggested above.

Rhachisellus Bourguignat, 1889, Moll. Afr. Equator., p. 68; as a genus including, among others, *Bulimus punctatus* Anton designated as type.

Bourguignat in 1889 (*op. cit.*, p. 56) designates as type of *Rachis* Albers the first named species, *Bulimus pallens* Jonas. Thiele follows this, in the supposition that v. Martens' type designation of 1860 was invalid, *B. punctatus* not being given by Albers among the species referred to *Rachis* in 1850. But since *B. ferussaci* Dunker, which is quoted under *Rachis* by Albers, is a synonym of *B. punctatus* Anton, it seems to me that v. Martens' designation of the type might be valid.

Shell conical or ovate, thin, perforate; the perforation often partly covered by the reflexed columellar margin; spire acuminate; last whorl rounded or obtusely angulate in the middle. Coloration of dark bands or dots on a whitish ground, or without markings. Aperture small; peristome simple, acute.

It appears from the work of Schako and Thiele that *Rachis* as commonly understood will have to be divided; but the data published are insufficient and material for a revision is not at hand.

200. **Rachis punctatus** (Anton)

Bulimus punctatus Anton, 1839, Verzeichniss der Conchyl., p. 42 (no habitat given).

Bulimus ferussaci Dunker, 1845, Zeits. f. Malak., II, p. 164; 1853, Index Moll. Guineam infer., p. 6, Pl. i, figs. 35 and 36 (type locality: near Loanda). Morelet, 1868, Voy. Welwitsch, Moll. terr. et fluviat., p. 60.

Buliminus (*Rhachis*) *punctatus* Anton. E. v. Martens, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 76.

Rhachisellus punctatus Anton. Bourguignat, 1889, Moll. Afr. Equator., p. 69, Pl. v, fig. 10.

Ena (*Rachisellus*) *punctata* Anton. J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 201.

This snail is common in British India and in Ceylon. It is also found in Zanzibar and along the East African coast from Makdischu (Somaliland) to Tete (on the Zambesi), Rhodesia, and northern Transvaal. In West Africa it has been recorded from several localities in Angola (Loanda, Sansamanda, between Banda de Libongo and Bombo, in the district Dande, and on the Quanza River).

Moanda, estivating under a log and on the poles of a fence; abundant (Lang and Chapin Coll.).

These shells are copiously streaked with cinnamon on a cartridge-buff to cream-buff ground, with many gray dots strewn on the last whorl, the apex, a subperipheral band and an umbilical band chestnut-brown. The general color therefore is browner than Dunker's figures of *B. ferus-*

saci (which v. Martens intimates were from partially bleached shells); and darker than *punctatus* compared from India and Ceylon. They differ further from Indian *punctatus* by the much less convex whorls. In the Moanda shells they are only feebly convex. Under the microscope the last whorl shows distinct engraved spiral lines. Except one shell from Ceylon, I have not found any lines on the last whorl of Indian *punctatus*.

The usual length of adults is 12.5 mm.

It appears rather likely that this species in West Africa was incidentally imported from India by the Portuguese, probably in estivation, adhering to lumber or plants.

201. **Rachis braunsii** (v. Martens)

Buliminus (*Rhachis*) *braunsii* E. v. MARTENS, 1869, Nachrichtsbl. D. Malak. Ges., I, p. 150 (type locality not known; the type specimens were found among sesam imported from East Africa); 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 72. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 21.

The typical form is common throughout German East Africa. It was also found in the Katanga district: Bukama, Kipochi (on the Luapula River), and Sampwe (Bequaert Coll.).

Faradje, in the savannah (Lang and Chapin Coll.).

As no authentic specimens of *R. braunsii* are at hand, and the Faradje examples do not wholly agree, the identification is provisional, though I believe correct. The 28 specimens agree in pattern. On a pale buff ground there are two spiral series of chestnut-brown spots above the periphery, wanting on part or rarely all of the last whorl, but invariable on the spire. There are two bands of the same color below the periphery. Apex minutely dark-tipped. The surface is very minutely and closely striate spirally, a feature not mentioned in the description of *braunsii*. There are no pink bands, such as *braunsii* has.

Length, 13 mm.; diameter, 7.5 mm.

Rachis braunsii quadricingulatus (Smith)

Bulimus (*Rhachis*) *quadricingulatus* E. A. SMITH, 1890, Ann. Mag. Nat. Hist., (6) VI, p. 153, Pl. v, fig. 6; type locality: plains within 50 miles of Mamboya in Usagara, German East Africa.

Buliminus (*Rhachis*) *braunsii* var. *quadricingulatus* Smith. E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 72. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 22.

Kalengwe (Katanga district; Bequaert Coll.).

"Only one immature specimen was obtained; it was found estivating (September 1911), its aperture closely fixed against the bark of a tree in the savannah; the shell was thickly coated with dirt" [J.B.].

Rachis bohmi (v. Martens)

Buliminus (*Rhachis*) *böhmi* E. v. Martens, 1895, Nachrichtsbl. D. Malak. Ges. XXVII, p. 181; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 70, Pl. III, fig. 39; type locality: eastern shore of Lake Tanganyika.

202. **Rachis böhmi delicatus,** new subspecies

Faradje, 1 specimen (Lang and Chapin Coll.).

The shell (Fig. 153) resembles typical *Buliminus böhmi* v. Martens in form. The outlines of the spire are very slightly concave; whorls weakly convex, the last a little subangular in front. At the summit only the first half whorl is depressed. Sculpture of irregular, strongly oblique growth-wrinkles, and on the last three whorls close, fine spiral striæ. It is very thin, nearly straw-yellow, becoming naples yellow towards the apex, which is not darker. There is a chestnut-brown band at the periphery, very narrowly showing above the suture, and another in the middle of the base, a very faintly brownish patch around the perforation. The outer lip is thin, not arched forward. Columella vertical, with very broadly dilated edge, which almost closes the umbilical perforation.

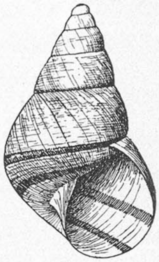

Fig. 153. *Rachis böhmi delicatus*, new subspecies.

Length, 15 mm.; diameter, 9 mm.; length of aperture, 8 mm.; 6¼ whorls.

While this form agrees with *böhmi* in general appearance, it has a fine spiral sculpture, easily visible with a hand-lens, which is not mentioned in the description of that species.

PACHNODUS v. Martens

Pachnodus E. v. Martens, 1860, Die Heliceen, p. 230; as a subgenus of *Buliminus;* type by original designation: *Buliminus velutinus* Pfeiffer.

Pachnodes Wiegmann, 1898, Mittheil. Zool. Samml. Mus. f. Naturkunde Berlin, I, pp. 81-85; anatomy of type species.

The type of *Pachnodus* is a species of the Seychelles. I have verified the generic position of *P. spiraxis* by examination of the soft anatomy. The tail is rounded under the shell, but rises in a somewhat serrate crest or keel posteriorly, as figured by Wiegmann for *P. velutinus* (Pfeiffer).

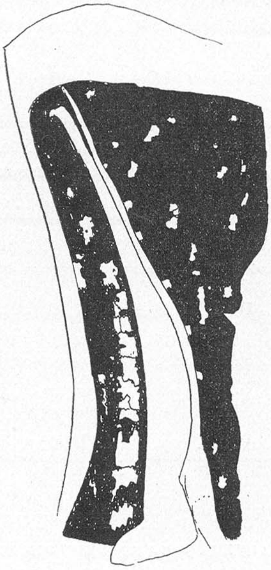

Fig. 154. Lung of *Pachnodus spiraxis*, new species.

The lung (Fig. 154) shows no macroscopic venation except the pulmonary vein. It is intense black with angular white spots and flecks. Kidney long, band-like, with direct ureter.

The penial appendix is long, terminating in a capacious oblong gland with thin, dark-colored walls (Fig. 155). A branch of the retractor muscle is inserted near its base. There is a small horn on the penis above it. The spermatheca is also rather long, differing in this detail from *P. velutinus.*

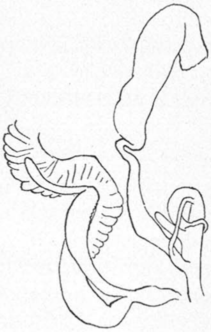

Fig. 155. Genitalia of *Pachnodus spiraxis,* new species.

203. **Pachnodus rutshuruensis,** new species

Rutshuru, type locality, in the forest gallery along the Rutshuru River at about 1200 m., 7 specimens. Also at Penge in the Ituri Forest, 1 specimen (Bequaert Coll.).

The shell (Fig. 156) is broadly ovate-conic, openly and deeply umbilicate, thin, matt and snuff-brown when perfect, but more clay-colored and slightly glossy in its usual condition. The spire is straightly conic, apex obtuse, the first whorl strongly convex but nearly in a plane above, very finely, superficially striate vertically and densely, microscopically striate spirally throughout. Whorls of the spire convex, finely, irregularly and obliquely striate, densely and very superficially striate spirally under the microscope. The last whorl is rounded throughout and similarly sculptured, but when well preserved it has delicate cuticular threads on the spiral striæ, readily visible with a hand-lens. The suture is well impressed. The aperture is somewhat oblique, ovate; outer and basal margins of the peristome thin but blunt, unexpanded, pale-edged. Columellar margin broadly dilated. The rather large umbilicus is almost equally ample within, permitting a view almost to the apex. The shell-wall, within it, has a shallow spiral concavity, in which there are often some sharp spiral impressions. This concavity produces a slight excavation at the base of the columella, visible in an oblique view in the aperture, and most pronounced in immature shells.

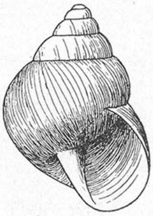

Fig. 156. *Pachnodus rutshuruensis,* new species.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*	
12.9 mm.	9.0 mm.	7.0 mm.	5½	Type
14.0	9.3	6.9	6	

No closely related species has come to my notice. It has a dull velvety outer coat as in some other species of this genus, but this is soon lost from dead shells. None were preserved in alcohol. Some imperfect specimens indicate larger dimensions than those given above: length, about 14 mm.; diameter, 10.4 mm.

A single dead shell was taken at Penge.

204. **Pachnodus spiraxis,** new species

Plate XXIII, Figure 8

Kilo, in the Rain Forest at about 1000 m., 1 specimen (Bequaert Coll.).

The shell is imperforate, broadly ovate-conic, thin, old-gold colored, dull but with a somewhat silky sheen. The spire is straightly conic, apex obtuse. Whorls rather strongly convex, the later ones covered with a thin cuticle bearing minute, very close cuticular spiral threads except in front of the aperture, where it is glossy. Suture well impressed. The aperture is ovate, oblique. Outer and basal margins of the peristome thin, unexpanded. Columella subvertical, curved in a thin, spirally entering fold, the outer edge closely appressed, passing into the thin parietal callus.

Length, 16.8 mm.; diameter, 10.2 mm.; length of aperture, 9.2 mm.; 5¾ whorls.

This species is remarkable for its strongly folded columella and wholly imperforate axis. The cuticle is scaling off, owing to preservation for several months in alcohol. See under the generic head for description of the soft anatomy (Figs. 154 and 155).

205. **Pachnodus herbigradus,** new species

Faradje, in the savannah (Lang and Chapin Coll.).

The shell (Fig. 157) is very small, conic, narrowly umbilicate, isabella color, glossy. The spire is straightly conic, of strongly convex whorls, the apex somewhat obtuse. Sculpture of light, oblique growth-lines only. The last whorl is strongly convex, indistinctly subangulate at the periphery. The suture is deeply impressed. Aperture oblique, shortly oval, the peristome thin, unexpanded except at the columellar margin, which is broadly, triangularly dilated. Parietal callus scarcely perceptible.

Altitude, 5 mm ; diameter, 3.5 mm.; 4¾ whorls.

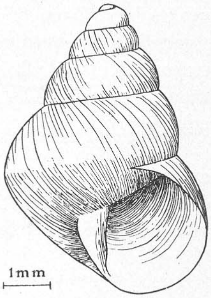

Fig. 157. *Pachnodus herbigradus*, new species.

Twenty specimens were taken, associated with *Rachis braunsii*. They were estivating, having a wrinkled, papery brown epiphragm. The shells are liberally daubed with dirt, like many Pupillidæ.

"Colonies of these tiny snails were found estivating in hollow twigs, five feet or more from the ground. They occupied about two inches near the entrance, through which many ants[1] were passing in and out, and were attached at irregular intervals, sometimes singly or in small clusters two or three deep alternating on the sides of the gallery, with just sufficient space left for the ants to pass. The snails had secreted the usual tiny pellicle around their apertures, affixing themselves, and a coarse brown coating cemented one so firmly to another and to their resting place that they could hardly have been detached without breaking had we not moistened them. The quality and thickness of the wood without doubt offered sufficient security to these snails during the grass-fires, which at about this time (late December to February in the Uele) sweep the country. For a few minutes only is the heat so intense as to injure bushes, but it seldom destroys them. The snails must have crept into these abodes at the beginning of the dry season, and we were puzzled to know whether they follow one another's slimy track, for in some bushes were many such hollow twigs with not a single snail, but when they occurred at all they were found in numbers. In the rainy season we came across a few of them in the morning creeping singly on the wet grass stalks, about a foot from the ground. While collecting accessories for a habitat group of rhinoceros we carefully investigated the bases of many bushes, but found no snails estivating there" [H. L.].

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[1] Named by Dr. Santschi *Crematogaster excisa* Mayr subspecies *impressa* Emery var. *euphrosyne* Santschi.

CERASTUS Albers

Cerastus Albers MS. in E. v. MARTENS, 1860, Die Heliceen, p. 232; as a subgenus of *Buliminus* with *Buliminus distans* Pfeiffer designated as type. KOBELT, 1902, Syst. Conch. Cab., I, Abt. 13, 2, Buliminidæ, pp. 1021 and 1023; as a genus. KOBELT AND V. MÖLLENDORFF, 1903, Nachrichtsbl. D. Malak. Ges., XXV, p. 40.

E. v. Martens' original diagnosis (1860) is as follows: "Shell rimate, ovate, costulate or finely striate, thin corneous; 6 to 7 slightly convex whorls, the last one nearly as long as the spire. Aperture rounded oval, with reflexed peristome; its margins converging, united by a slight callus."

Kobelt and v. Möllendorff (1903) include in *Cerastus* a large number of African Enidæ, apparently most of the species with thickened peristome; unfortunately they do not indicate the characters of the genus. They subdivide it further into three subgenera, of which type species but no descriptions are given: *Xerocerastus* Kobelt, type: *Bulimulus damarensis* H. Adams, comprises a number of species chiefly from the arid regions of southwestern Africa (Ovampoland, Bechuanaland, Damaraland, Namaqualand, Griqualand West, Zululand).[1] *Petræocerastus* Kobelt is chiefly found in Southwestern Arabia.[2] *Cerastus* in the restricted sense seems to correspond to E. v. Martens' *Buliminus trapezoideus*-group and part of his *B. abessynicus*-group[1]; it would include the East and Central African Enidæ with strongly thickened and distinctly reflexed peristome; the shell is medium-sized, conic-turriform, often covered with a brownish cuticle; the sculpture of the early whorls is vertically striate, usually different on the later whorls. The soft anatomy has apparently never been published. The distribution of this subgenus *Cerastus* can only be approximately given as northeastern Africa between 15° N. lat. and 5° S. lat., from the coast of the Indian Ocean to 29° E. long. (see map, Fig. 158).

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[1] See the localities given by Connolly, 1912, Ann. South Afr. Mus., XI, 3, pp. 165-176. Kobelt and v. Möllendorff include also in *Xerocerastus*, *Bulimus connivens* Pfeiffer which has been recorded from West Africa (Senegambia or Gaboon); but this species has not been found in recent years and its habitat seems doubtful.

[2] The only exception is *Bulimus lamprodermus* Morelet, from Abyssinia, which is also placed in *Petræocerastus* by Kobelt and v. Möllendorff.

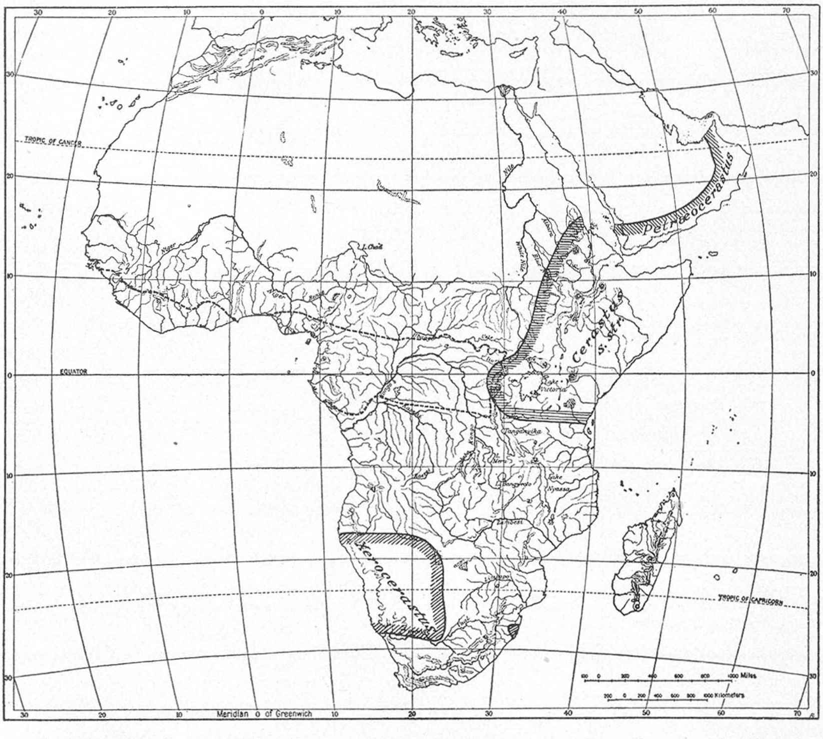
Petræocerastus
Cerastus s. str.
Xerocerastus
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
Meridian 0 of Greenwich
Nile
L. Chad
Lake Victoria
Tanganyika
Lake Nyassa
Zambezi
Niger
30
20
10
0
10
20
30
40
50
60
70

Fig. 158. Distribution of the subgenera of *Cerastus*. *Petræocerastus* in southern Arabia; *Cerastus, sensu stricto* in northeastern Africa; *Xerocerastus* in Southwest Africa, with one record (*X. zuluensis*) for Zululand.

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[1] Kobelt and v. Möllendorff (1903) still take in their subgenus *Cerastus*, *s. str.* many species which have been found since to belong to *Pseudoglessula*. It seems probable that the true *Cerastus* are restricted to northeastern Africa and the mountains of Central Africa.

The following species collected by Bequaert are of special interest, coming from the extreme western limits of the range of *Cerastus, sensu stricto.*

"The beautiful snails of the genus *Cerastus* do not occur below 1500 m. in the mountains of the eastern Belgian Congo. They are one of the characteristic elements of the mollusk fauna of the 'subtropical or lower mountain forest' between 1700 and 2500 m.; this region is often densely settled and is therefore also called the 'cultivation zone,' the original woody vegetation being then only found in ravines. On Mt. Ruwenzori at 2200 m. (April 1914), many dead specimens of *C. retirugis* (v. Martens) were collected in the native bean, pea, and taro fields; but only after much trouble were two living individuals discovered beneath a thick layer of moist, decaying leaves, in a deep ravine, near the very edge of the Butagu River. In December 1914, I found *C. bequaerti* very abundant in the luxuriant mountain forest near Masisi, where in the early hours of the day numerous specimens could be seen crawling everywhere over the moss and humus soil, and frequently crossing the path; I did not see them on bushes" [J. B.].

206. **Cerastus retirugis** (v. Martens)

Buliminus retivugis E. v. MARTENS, 1895, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 128.

Buliminus retirugis E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 60, Pl. III, fig. 25. POLLONERA, 1909, Il Ruwenzori, Parte Scientif., I, p. 196.

Ena (*Cerastus*) *retirugis* v. Martens. E. A. SMITH, 1909, Trans. Zool. Soc. London, XIX, p. 44. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 202.

Mt. Ruwenzori: western slope in the Butagu Valley, bamboo forest at 2500 m. (type locality; Stuhlmann Coll.). Smith records it from the same mountain, without definite locality, and Pollonera from the eastern slope in the Upper Mobuku Valley. Thiele gives it from the Rugege Forest at 1800 m.

According to E. A. Smith (1909) *Ena lagariensis* Smith[1] is probably only a variety of this species in which the malleation is almost obsolete; and *Buliminus* (*Petrœus*) *aloysii-sabaudiœ* Pollonera, from the eastern slope of Mt. Ruwenzori, is the same or a very closely allied form.

Mt. Ruwenzori: western slope, in the Butagu Valley between 2000 and 2500 m., and in the Lanuri Valley at about 2000 m. Also from Masisi at about 1800 m. (Bequaert Coll.).

This species is variable in size, sculpture and color. The specimens from the Lanuri Valley have (1) colonial buff riblets and reticulation on an ecru-olive ground, the peristome white; (2) buff reticulation on a cinnamon-brown or russet ground, the outer lip faintly brown; or (3) naples yellow reticulation on a seal-brown ground, the peristome faintly fawn throughout. The reticulation is generally well developed, and the shape relatively slender.

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[1] *Ena* (*Cerastus*) *lagariensis* E. A. Smith, 1904, Proc. Malac. Soc. London, VI, p. 68, fig. i. Lagari, British East Africa.

At 2200 m. in the Butagu Valley, the shells are stouter in form, russet, with very little yellow except on the reverse of the peristome. The last whorl is more or less malleate but not reticulately wrinkled. The beautiful sculpture of oblong granules, or close vertical wrinkles cut by incised spirals, is well developed.

Length	*Diameter*	*Length of Aperture*	
28.0 mm.	14.3 mm.	13.0 mm.	Lanuri Valley
24.9	13.9	12.9	Lanuri Valley
30.0	17.5	15.0	Butagu Valley
26.0	16.0	13.9	Butagu Valley

207. **Cerastus bequaerti,** new species

Plate XXIII, Figures 1 to 4

Masisi, type locality, at about 1800 m., 130 specimens. Also at Mbisi near Masisi (Bequaert Coll.).

The shell is ovate-conic, perforate, rather thin, nearly white, but the summit and last whorl rather cartridge-buff, the rest of the spire and the malleations of the last whorl pale gray; a broad band behind the lip of varying violaceous shades. The outlines of the spire are weakly concave. First 2½ whorls are smooth, the rest of the spire weakly rib-striate. The last 1½ whorls are coarsely malleate, finely, irregularly, and weakly striate over the malleation. The aperture is oblong, slightly oblique. The peristome is white, broadly reflected, strongly arched near the upper end of the outer lip, broadly bordered with chestnut-brown within the outer and basal lips, and the inner part of the columellar lip; the parietal callus of a more dilute shade of the same color.

Length	*Diameter*	*Length of Aperture with Peristome*	*Number of Whorls*
30.5 mm.	14.0 mm.	15.0 mm.	6½
29.5	12.4	14.0	7
25.0	13.0	12.5	6½
23.0	11.8	11.0	

The conspicuous malleation and nearly white color, with contrasting dark apertural margins make this a striking snail. It recalls *Leucocharis.*

208. **Cerastus bequaerti mokotoensis,** new subspecies

Plate XXIII, Figures 5 and 6

Mokoto near Masisi (Bequaert Coll.).

The shell is similar to the shortest examples of *C. bequaerti* in shape, pale buff, the penult whorl slightly more grayish, narrowly perforate, moderately solid though thin. The spire has stronger rib-striæ than *C. bequaerti;* last whorl finely and closely malleate, with several weak spiral threads. The peristome is narrower than in *C. bequaerti*, reflected and recurved, white. The upper part of the columella and the whole parietal wall (or a broad band across it) are chestnut.

Length	*Diameter*	*Length of Aperture*	*Number of Whorls*
25.5 mm.	13 mm.	11.6 mm.	6½ Type
21.4	12	10.6	6⅓ Smallest
23.7	14	11.8	

This form appears to be intermediate between *C. bequaerti* and *C. partulæformis* Preston, differing somewhat from both in sculpture.

One specimen in the series of ten has a narrow brown border within the outer lip.

209. **Cerastus bequaerti mukulensis,** new subspecies

Mukule at 1800 to 2000 m. (Bequaert Coll.).

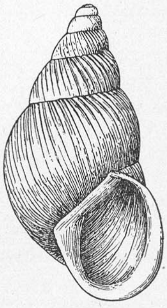

Fig. 159. *Cerastus bequaerti mukulensis,* new subspecies. × 2.

The shell (Fig. 159) is ovate-conic, umbilicate, moderately solid. The summit is obtuse, the first whorl very little elevated, russet, smooth; second whorl smooth, russet below the suture. Following whorls convex, white under a thin yellow cuticle, obliquely rib-striate, without spiral striation or granulation. The last whorl is more swollen, closely malleate, especially dorsally; hardly costulate except in front. There are some weak, fine axial striæ over the malleation in places, but no spiral striation or granulation. The aperture is slightly oblique. Peristome rather narrowly reflected, white.

Length	*Diameter*	*Length of Aperture with Peristome*	*Number of Whorls*
20.0 mm.	10.5 mm.	9.5 mm.	6⅓
17.4	9.4	8.6	6

This subspecies differs from *C. vexillum* Thiele in sculpture. *C. kempi* Preston and *C. partulæformis* Preston are apparently allied, but both are somewhat broader, with quite different coloration.

210. **Cerastus lucasi,** new species

Plate XXIII, Figure 7

Masisi at about 1800 m., 1 specimen (Bequaert Coll.).

The shell is narrowly umbilicate, ovate-fusiform, rather thin, glossy, cream-buff; a slightly darker, hardly noticeable band at the periphery; darkening to cinnamon on the back of the lip; the apex is minutely tipped with cinnamon. The spire is somewhat slender in the upper part, the whorls are rather weakly convex, obliquely striate, the last whorl more swollen, finely malleate in inconspicuously spiral pattern, and very minutely, unevenly striate along growth-lines. At the base, some faint spiral lines cut the striæ. The sculpture is not noticeably coarser towards the outer lip. Suture impressed, even, margined with a fine light line, below which it is slightly darker. The aperture is oblong, pure white within. The peristome is expanded and reflected, chestnut-brown with a white edge, a dilute tint of the chestnut spreading a short distance above the columella, which is also chestnut-brown. The umbilicus is half covered.

Length, 24.6 mm.; diameter, 12 mm.; length of aperture, 11.5 mm.; 6½ whorls.

This species is evidently related to *C. kempi* Preston. It is larger, more elongate; the aperture is more oblong, and the details of color and especially of sculpture are different. The lip is straight in profile, while *kempi* is said to have projections. It is a handsome species having much the aspect of an American *Drymæus*. Named for Dr. F. A. Lucas.

Other Species of *Cerastus* Recorded from the Belgian Congo

Cerastus drymæoides (Thiele)

Ena (*Rachisellus*) *drymæoides* J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 202, Pl. v, fig. 39.

Type locality: Island Kwidjwi (Schubotz Coll.).

Cerastus kempi Preston

Cerastus kempi Preston, 1913, Rev. Zool. Afric., III, p. 51, Pl. iv, fig. 3.

Type locality: Burunga at the foot of Mt. Mikeno, at 6000 feet (Kemp Coll.).

Cerastus kivuensis Preston

Cerastus kivuensis Preston, 1913, Rev. Zool. Afric., III, p. 50, Pl. iv, fig. 1.

Type locality: near Lake Kivu (Kemp Coll.).

Cerastus partulæformis Preston

Cerastus partulæformis Preston, 1913, Rev. Zool. Afric., III, p. 52, Pl. iv, fig. 2.

Type locality: near Lake Kivu (Kemp Coll.).

Cerastus trapezoideus (v. Martens)

Buliminus trapezoideus E. v. Martens, 1892, Sitz. Ber. Ges. naturf. Fr Berlin, p. 176; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 59, Pl. iii, fig. 24.

Type locality: Mt. Ruwenzori, western slope in the Butagu Valley, bamboo forest at 2600 m. (Stuhlmann Coll.).

Cerastus vexillum (Thiele)

Ena (*Cerastus*) *vexillum* J. Thiele, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 202, Pl. v, fig. 40.

Type locality: Mt. Ninagongo at 2500 to 3000 m. (Grauer Coll.).

The following species has been described from the eastern slope of Mt. Ruwenzori:

Cerastus aloysii-sabaudiæ (Pollonera) = *Buliminus* (*Petræus*) *aloysii-sabaudiæ* Pollonera, 1906, Boll. Mus. Zool. Anat. Comp. Torino, XXI, No. 538, p. 2; 1909, Il Ruwenzori, Parte Scientif., I, p. 196, Pl. xx, fig. 9. Type locality: eastern slope of Mt. Ruwenzori in the Mobuku Valley at about 2000 m. Smith considers this very close to or possibly identical with *C. retirugis* (v. Martens).

Ferussacidæ

CÆCILIOIDES Herrmannsen

Cæcilioides HERRMANNSEN, 1846, Indicis Generum Malac., I, p. 150. PILSBRY, 1908, Man. of Conch., (2) XX, p. 1.

Minute, slender, smooth, clear corneous or whitish shells, having an obtuse apex and few oblique whorls, the aperture ovate, the columella truncate below in the typical forms. Most of the species are from 2 to 6 mm. long, but *C. stuhlmanni* is 9 mm.

Type: *Buccinum acicula* Müller.

A few typical *Cæcilioides* have been described from South Africa[1]; two species have also been recorded from Abyssinia, but it is a question whether one of them is a member of the genus. The taxonomic status of the following species which was described as a *Geostilbia*, was left doubtful by v. Martens. It has not been found by any of the later collectors. Two species from Naivasha, British East Africa, are true *Cæcilioides*, though described as *Subulinæ*.[2]

Cæcilioides stuhlmanni (v. Martens)

Geostilbia stuhlmanni E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 131, Pl. v, fig. 33.

Cæcilioides (*Geostilbia*) *stuhlmanni* v. Martens. PILSBRY, 1908, Man. of Conch., (2) XX, p. 48, Pl. IV, fig. 70.

Type locality: Mt. Ruwenzori, western slope in the Butagu Valley, bamboo forest at 2600 m. (Stuhlmann Coll.).

Vaginulidæ

(VAGINULIDÆ and VERONICELLIDÆ of authors[3])

Oblong, depressed slugs, without a shell, covered by a coriaceous mantle which is not different from the general envelope of the body, and is keeled at the edge; the lower surface being longitudinally tripartite, the sole occupying the middle third. Head retractile within an anterior cavity; four tentacles, the upper ones cylindric, contractile, the lower ones bifid. Sexual orifices very distant: the male orifice placed behind the right lower tentacle; the female at the under side of the body, near the right margin of the foot, about a third or the middle of its length. Cloaca and respiratory orifices posterior.

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[1] Connolly, 1912, Ann. South Afr. Mus., XI, 3, p. 207, seems to believe that most of these South African species are not different from *C. acicula* (Müller), a species which has been introduced from Europe in various parts of the world.

[2] *Subulina virgo* Preston and *S. tribulationis* Preston, 1911, Rev. Zool. Afric., I, p. 220.

[3] The family name based upon the generic name *Vaginulus* Férussac, 1821, Tabl. Syst., p. 13, is preferable to that based upon *Veronicella* Blainville, 1817, Journ. de Physique, p. 440, because the characters of the latter are imperfectly known. Its type species, *V. lævis* Blainville, has not been rediscovered; it was described and figured as having an imperfect shell under the notæum, doubtless imaginary, and a female orifice much further back than in any species known to modern naturalists.

The type of *Vaginulus* is *V. taunaisii* Férussac, of Brazil. Why Férussac gave *Vaginulus* a masculine form is not apparent.

This family of slugs is found throughout tropical and subtropical regions in both hemispheres. They inhabit nearly all of tropical and subtropical Africa, in a great variety of genera and species; but few have been collected in sufficient quantity for working out the range of variation. Twenty or thirty, of all sizes, should be taken, where they are found in abundance. They often occur in large numbers underneath decayed vegetation.

"Our Vaginulidæ were nearly all collected in the neighborhood of villages and in plantations. They were never seen to crawl about in the sun; but after especially rainy days, they can be found in numbers sitting and crawling between heaps of decayed vegetable matter and also on the under side of banana leaves. Their favorite retreats are the recesses in and the ground below fallen papaw and plantain trunks; relatively dry sites where they lie slightly curled up and apparently lifeless; such a refuge is shared with pillbugs (isopods), millipeds, and various batrachians. These slugs are not particularly slimy, but when handled strong mucus excretion follows" [H. L.].

The African forms are chiefly known from three elaborate papers by H. Simroth.[1] In the third of these, an intricate classification of the African species is proposed, though curiously enough it is not used, all of the species being described under the genera *Vaginula* and *Vaginina*.[2] He also omits to fit into his new classification the species described by him in 1897 (Deutsch Ost Afrika, IV, Nacktschnecken).

LÆVICAULIS Simroth

Lævicaulis SIMROTH, 1913, Voeltzkow's Reise in Ostafrika, Wiss. Ergebn., III, 3, pp. 147 and 202; for *Vaginula comorensis* Fischer, which is here designated as type.

Eleutherocaulis SIMROTH, 1913, *op. cit.*, p. 202; as a genus containing two subgenera: *Lævicaulis* (with several species, among them *V. comorensis*) and *Annulicaulis*.

Cloaca on or near the middle line. Penis smooth, free to its base. Pedal gland having the shape of a spiral tube.

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[1] See the bibliography given under the Urocyclidæ, especially the papers 1897*c* and 1912*a*; also the following:

Simroth, H. 1913. Ueber die von Herrn Prof. Voeltzkow auf Madagascar und in Ostafrika erbeuteten Vaginuliden nebst verwandten Material von ganz Afrika. Voeltzkow's Reise in Ostafrika, Wiss. Ergebn., III, 3, pp. 129-216, Pls. xiii-xvii.

[2] *Vaginina* Simroth, 1897, Sitz. Ber. Nat. Ges. Leipzig, XXII-XXIII, (1895-96), p. 154; defined but no species mentioned; 1913, Voeltzkow's Reise in Ostafrika, Wiss. Ergebn., III, 3, p. 192, for *Vaginina togoensis* Simroth and *V. conradti* Simroth, both from Togo.

= *Vaginulopsis* Simroth, 1912, Bronn's Klassen u. Ordnungen des Tierreichs, III, Mollusca, Abt. 3, p. 513; defined but no species mentioned. This name was ignored later by Simroth, probably because it is a *vox hybrida*, and *Vaginina* is older.

Simroth subdivides these slugs into two subgenera:

A. *Lœvicaulis* proper, 1913, *op. cit.*, p. 202. Penis smooth to its extremity.

B. Subgenus *Annulicaulis* Simroth, 1913, *op. cit.*, pp. 187 and 202. Penis with a muscular ring below its apex. Includes *V. brauni* Simroth, *V. kitotoensis* Simroth, *V. æquatorialis* Simroth, and *V. stuhlmanni* Simroth. *V. kitotoensis* may be selected as type.

Subgenus Annulicaulis Simroth

211. **Lævicaulis (Annulicaulis) schnitzleri** (Simroth)

Plate VII, Figures 4 and 4*a*

Vaginula schnitzleri Simroth, 1895, Sitz. Ber. Nat. Ges. Leipzig, XIX-XXI, (1892-94), p. 62; 1897, Deutsch Ost Afr., IV, Nacktschnecken, p. 15, Pl. II, fig. 13.

Type locality: Karevia in the Semliki Valley, western foot of Mt. Ruwenzori at 1300 m. (Stuhlmann Coll.).

Rutshuru, in the forest gallery along the Rutshuru River, and Avakubi (Bequaert Coll.). Medje (Lang and Chapin Coll.).

This species was described from an individual 31 mm. long but sexually immature. The mature individual from Rutshuru here figured measures:

Length, 34 mm.; width, 9.5 mm.; thickness, 6 mm.; width of sole, 3 mm.; distance of female orifice from anterior end, 22.5 mm.

The back is dusky yellowish gray, a little darker towards the ends, with an indistinct pale dorsal line, and some scattered black spots not very distinct. Under a lens a minute black punctation is seen. The

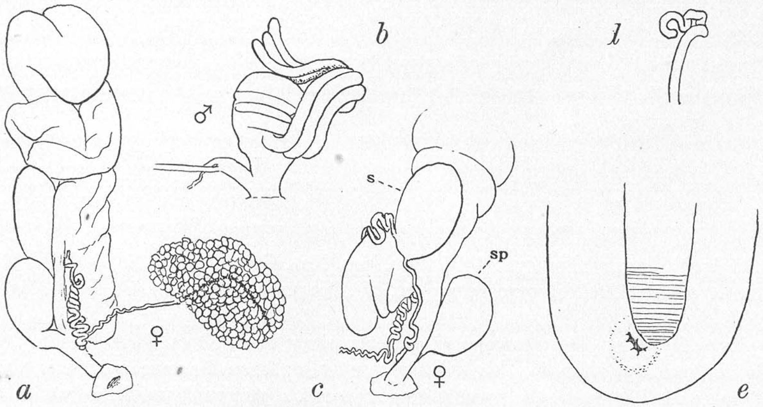

Fig. 160. *Lœvicaulis* (*Annulicaulis*) *schnitzleri* (Simroth), from Rutshuru: *a*, *b*, and *c*, genitalia: s, spermatocyst; sp, spermatheca; *d*, pedal gland; *e*, tail from below.

peripheral angle has a narrow dark border above. The hyponotæum is chamois with a black border, the sole olive. The four tentacles are about equally prominent. The cloaca is somewhat to the right of the median line, though less than appears in Pl. VII, fig. 4, as the end of the sole was pushed to the left in that drawing, in order to show the orifice fully.

Another specimen is similar below, but the notæum is paler with very indistinct gray spots and very minute dots. In a third specimen the notæum and hyponotæum are somewhat darker than in the figure; perinotæum black, the sole buff. A fourth specimen is isabella color above, light brownish olive below, without a dark perinotæum.

The genitalia (Fig. 160*a-c*) show great similarity to *Lævicaulis* (*Annulicaulis*) *stuhlmanni* (Simroth). The penis is very small, of the acrocaul type. The so-called dart gland has seven mucus tubes, four of them longer than the others. The female organs do not differ materially from those of *L. stuhlmanni* except that the spermatocyst and the spermatheca are about equal in size.

The pedal gland is short, as in *L. stuhlmanni* (Fig. 160*d*).

One may well suspect that this species is only a form of *L. stuhlmanni* (Simroth). The color, as noted above, varies widely, and the differences in the internal anatomy do not appear to be of much importance.

A specimen from Avakubi measures: length, 24 mm.; width, 8 mm.; width of sole, 2.5 mm.; distance of female orifice from anterior end, 15 mm. The notæum and sole are sepia; hyponotæum a shade lighter, with dusky border.

Of the specimens from Medje, three are between olive-lake and citrine-olive, the hyponotæum paler, the sole dark olive. The longest is 32 mm. long. Two specimens are deep olive with a dark olive or even blackish wide dorsal stripe, the border and below the keel dusky, the sole dark olive.

Other Species of *Lævicaulis* Recorded from the Belgian Congo

Lævicaulis (*Annulicaulis*) *stuhlmanni* (Simroth)

Vaginula stuhlmanni Simroth, 1895, Sitz. Ber. Nat. Ges. Leipzig, XIX-XXI, (1892-94), p. 61; 1897, Deutsch Ost Afr., IV, Nacktschnecken, p. 14, Pl. ii, fig. 12; Pl. iii, fig. 5

Type locality: Mt. Ruwenzori, western slope at 1300 m. (Stuhlmann Coll.). Judging from the altitude, this locality must have been Karevia, which is also at 1300 m., and this makes the specific identity of *L. stuhlmanni* and *L. schnitzleri* still more probable.

PLEUROPROCTA Simroth

Pleuroprocta SIMROTH, 1913, Voeltzkow's Reise in Ostafrika, Wiss. Ergebn., II, 3, p. 191. Type by tautonymy: *Veronicella pleuroprocta* v. Martens.

Drepanoprocta SIMROTH, 1913, *op. cit.*, p. 202. "(*Pleuroprocta s. s.*)"; therefore having the same type: *V. pleuroprocta.*

According to Simroth, the characters of this genus are as follows: cloaca lateral, sickle-shaped; dart sac with a simple, perforate muscular spindle between the dart papilla and the dart gland tubes.

I do not understand why two generic names for this genus were proposed in the same paper. On page 191, in discussing the species of the *pleuroprocta*-group, Simroth writes: "alle gehören in die Verwandschaft der *Pleuroprocta*, die ich künftig als Gattungsnamen verwenden werde." On page 202, he proposes the generic name *Drepanoprocta* for "*Pleuroprocta s. s.*" adding the definition "mit sichelförmiger Afteröffnung," but naming no type. Under these circumstances it appears proper to adopt the first name.

The genus *Cycloprocta* Simroth, 1913, Voeltzkow's Reise, p. 202, is defined as "mit runder Kloaken- oder Afteröffnung," but no species is mentioned. *Pseudoveronicella* Germain[1] is well characterized by the single gland of the dart sac, its type being *Veronicella gravieri* Germain, from S. Thomé.

I failed to work out the male organs of the following species satisfactorily, but its other characteristics are those of *Pleuroprocta.*

212. **Pleuroprocta silvatica,** new species

Plate VII, Figures 1, 1*a*, 2, 5 and 5*a*

Lesse, type locality; Walikale and Penge (Bequaert Coll.). Medje (Lang and Chapin Coll.).

The notæum is isabella color with a faint gray suffusion sparsely sprinkled with black dots near the ends, a few small black spots and some paler mottling; but the markings are scarcely noticeable except when looked for under water. The lower surface is isabella color. The hyponotæum is somewhat concave. The head and tentacles are wholly retracted. The cloaca is very long and markedly lateral. The sole is widest at the anterior third.

Length, 36 mm.; width, 13 mm.; width of sole, 6 mm.; distance of female orifice from anterior end, 15 mm.; length of cloaca, 5 mm.; the pedal gland is very long, 23 mm. (Fig. 161*d*).

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[1] 1908, Bull. Mus. Hist. Nat. Paris, p. 59.

The male genitalia are not fully developed, but so far as worked out are drawn in Fig. 161*c*. The female organs are crowded close to the orifice (Fig. 161*a* and *b*).

At Penge a single individual broader and browner than the type was obtained. The notæum is bister, hyponotæum verona brown, sole isabella color.

Length, 31 mm.; width, 13 mm.; female orifice 15 mm. from anterior end.

At Walikale a dark form or race, which may be called **Pleuroprocta silvatica walikalensis** was taken (Pl. VII, figs. 3 and 3*a*). The color above is deep olive with indistinct darker longitudinal interrupted bands. The sole is dark olive-buff, sides dark grayish olive to olivaceous black. The hyponotæum is somewhat concave.

Length, 29 mm.; width, 9.5 mm.; female orifice 12 mm. from anterior end.

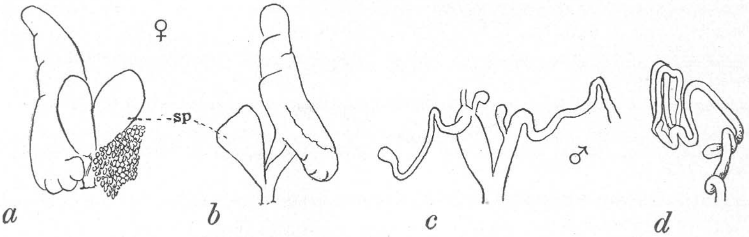

Fig. 161. *Pleuroprocta silvatica*, new species: *a*, *b*, and *c*, genitalia: sp, spermatheca; *d*, pedal gland.

The status of these several color forms cannot be determined without good series of various ages.

The species appears most nearly related to *Vaginula grisea* Simroth,[1] from Busu (Busoga), Uganda, which it resembles in color pattern though not in hue, in the cloaca, the female orifice, and by having the female organs crowded close to the orifice. The very long pedal gland is an important character of *P. silvatica*.

A long series of specimens from 10 to 40 mm. in length was taken at Medje. They are well extended, the entire head exposed in some, retracted in others. They were preserved in formalin, later transferred to alcohol.

The young specimens (Pl. VII, figs. 5 and 5*a*) are closely speckled with black above and generally also over the hyponotæum, the ground-color buffy brown to clove-brown. Sole much paler, generally dark olive-buff. In the examples having the darkest ground the upper surface appears almost evenly black unless closely examined. In those with lighter ground the spots are generally closer along a mid-dorsal band.

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[1] 1912, Revue Suisse de Zool., XX, p. 49, Pl. iv, figs. 7*A*-*G*.

In a few individuals the dark color and the spots on the notæum persist to the adult stage; length, 40 mm. Usually the large examples are uniform in color, ranging from clay color to Saccardo's umber, without spots. The specimens were evidently drowned, being limp and extended, showing four tentacles. In all other specimens referred to this species the tentacles are wholly retracted. A specimen measures: length, 37 mm.; female orifice 18 mm. from anterior end (Pl. VII, fig. 2).

Four specimens of this slug were taken from the stomach of *Varanus niloticus* (Linné), No. 10509, from Medje.

Other Vaginulidæ Recorded from the Belgian Congo

From the published data the following species cannot be properly placed in the classification recently proposed by Simroth.[1]

"*Vaginula*" *obscura* Simroth

Vaginula obscura SIMROTH, 1897, Deutsch Ost Afr., IV, Nacktschnecken, p. 17, Pl. II, fig. 15.

Type locality: Undussuma (Stuhlmann Coll.).

"*Vaginula*" *striata* Simroth

Vaginula striata SIMROTH, 1897, Deutsch Ost Afr., IV, Nacktschnecken, p. 16, Pl. II, fig. 11.

Type locality: Massiba (West Lendu; Stuhlmann Coll.).

"*Vaginula*" *substriata* Simroth

Vaginula substriata SIMROTH, 1897, Deutsch Ost Afr., IV, Nacktschnecken, p. 16, Pl. II, fig. 14.

Type locality: West Lendu in a forest gallery near the sources of the Abumbi River (Stuhlmann Coll.).

PECTINIBRANCHIATA

Streptoneurous, diœcious snails; the terrestrial forms dealt with here being operculate, and with the gill cavity transformed into a lung. The sexes are often characterized by differences of size or sometimes of shape of the shells, but no observations on this point have yet been made upon African species.

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[1] From Simroth's reference it would appear that these three species were named by him in 1895, Sitz. Ber. Nat. Ges. Leipzig, XIX-XXI (1892-94), which is not the case.

The land Operculata of Africa are all tænioglossate. The absence of the old and widely spread rhipidoglossate family Helicinidæ is remarkable.

The Congo representatives of the two families Cyclophoridæ and Pomatiasidæ are much alike as to the shell, which is turbinate, with a round mouth. These families are only remotely related, the Cyclophoridæ having the two marginal teeth of the radula narrow and similar, the sole of the foot simple; in movement they glide, like pulmonate snails. In the Pomatiasidæ the outer tooth of the radula is broad and comb-like; the sole is divided by a longitudinal sulcus, and movement is by muscular waves alternately on the two sides. In some genera these waves lift the sole free of the supporting surface, in others not so. No observations have been made on the locomotion of tropical African forms.

Key to Operculate Land Snails of the Belgian Congo

1. Operculum thin, horny externally, smooth with many narrow whorls........2.
Operculum calcareous externally; shell having spiral sculpture............3.

2. Shell moderately large and solid, without spiral sculpture, with a rather narrow umbilicus, and covered with a colored cuticle.......*Cyclophorus* de Montfort.
Shell minute (diameter, 3.25 mm.), broadly umbilicate, having two spiral keels..................................*Ditropis* (?) *papillaris* v. Martens.

3. Rather large (diameter, 20 to 25 mm.), spirally striate at suture and umbilicus; operculum smooth.................... *Tropidophora anceps* (v. Martens).
Minute (diameter, 2.7 mm.), spirally keeled; operculum having a spiral lamina externally...........................*Cyathopoma africanum*, new species.

Cyclophoridæ

This large family is very poorly represented in the Ethiopian Region. The map, Fig. 162, is intended to show the scanty information available at present with regard to the distribution of the African genera.

Chondrocyclus Ancey includes a few South African forms[1]. *C. convexiusculus* (Pfeiffer) with its var. *minor* (Benson), *C. exsertus* Melvill and Ponsonby, and *C. isipingoënsis* (Sturany), which occur in the coastal region of the Cape Colony and Natal, from Cape Town to Durban.

Cyclophorus is represented in East and Central Africa by the strictly Ethiopian subgenus *Maizania* of which the following closely allied forms have been described: *C. hildebrandti* v. Martens, *C. elatior* v. Martens, *C. intermedius* v. Martens, *C. rugosus* Putzeys, *C. olivaceus* (Bourguignat), *C. volkensi* v. Martens, *C. kibonotoensis* d'Ailly, *C. angolensis*, Dohrn, *C. wahlbergi* (Benson), and *C. magilensis* Craven. They extend along the East Coast from Port Grosvenor and Pondoland to Usambara; the northern limit goes from Mt. Kilimanjaro across Uganda to the northwestern corner of the Ituri Forest; in the central part of the continent they have been found in German East Africa and on various points of the Belgian Congo, and they probably occur over the major part of the Congo Basin; there is one record for northern Angola. The West African *C. leonensis* Morelet (Sierra Leone), *C. lilliputianus* Morelet (Gaboon), and *C. preussi* v. Martens (Kamerun) seem to differ from the East and Central African species by their minute size (altitude, 2.5 to 3.5 mm.) and the vertically costulate sculpture. The genus has also two representatives on San Thomé: *C. molleri* Nobre and *C. vandellii* Nobre, which are still more different, having spiral

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[1] The geographical data for these are taken from Connolly's Reference List (1912, Ann. South Afric. Mus., XI, 3, pp. 251-252).

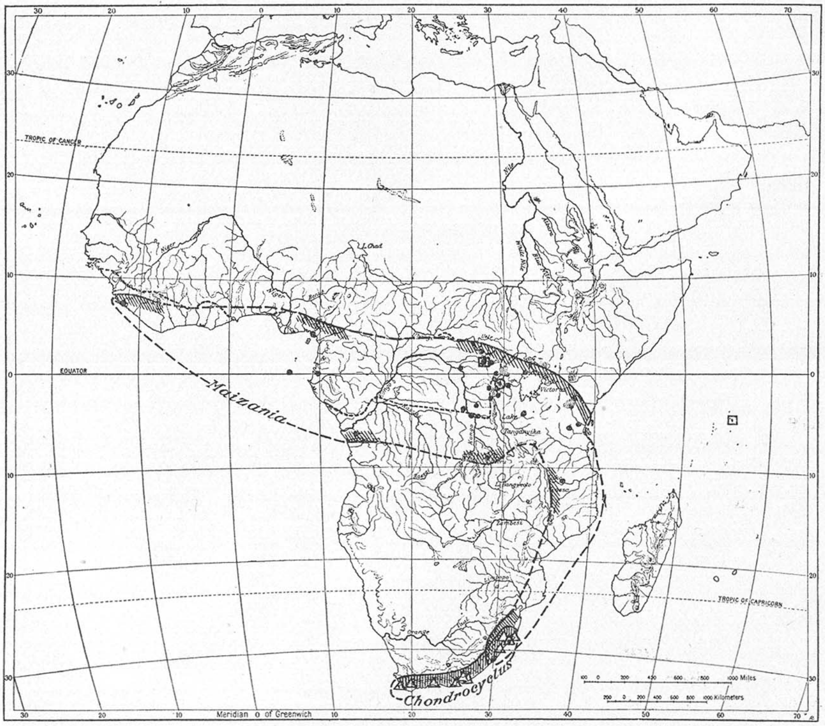
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
Maizania
Chondrocyclus
Niger
L. Chad
Nile
White Nile
Victoria
Lake Tanganyika
L. Bangweolo
Zambesi
Limpopo
Orange
Meridian 0 of Greenwich
Miles
Kilometers

Fig. 162. Distribution of Cyclophoridæ in Africa. *Chondrocyclus* in South Africa, locality records shown by triangles. *Maizania* in West, Central, and East Africa, locality records shown by dots. Isolated records of *Cyathopoma* (squares) and *Ditropis* (circle).

ribs on the last whorls; they are also of minute size (altitude, 3 to 3.5 mm.). However, owing to the simple sharp peristome and the horny, thin operculum, these little-known West African forms can be left provisionally in *Maizania.*

Ditropis (?) *papillaris* (v. Martens) from the southeastern shore of Lake Albert Edward, and *Cyathopoma africanum,* herein described from the Ituri Forest, are thus far the only representatives of these Oriental genera on the African continent. *Cyathopoma,* however, is represented by one species, *C. blanfordi* H. Adams, on the Seychelles. Four species of *Cyclophoridæ* are known from the Comoros: three have been referred to as many Oriental genera: *Japonia, Scabrina,* and *Mychopoma;* the fourth, *Cyclosurus mariei* Morelet, is a remarkable endemic type. The family has not been recorded from Madagascar and the Mascarenes.

CYCLOPHORUS de Montfort

Cyclophorus DE MONTFORT, 1810, Conchyl. Syst., II, p. 290.

Shell globosely turbinated, depressed discoidal, usually widely umbilicated. Aperture circular, peristome continuous, straight or expanded. Operculum circular, horny, thin, of numerous narrow whorls, more or less concave externally, smooth.

Type: *Helix volvulus* O. F. Müller.

This genus is found in southeastern Asia, the Malayan Archipelago, the Philippines, Japan, New Guinea, and the Ethiopian part of the African continent. All the African species belong to one subgenus.

Subgenus **MAIZANIA** Bourguignat

Maizania BOURGUIGNAT, 1889, Moll. Afr. Equator., p. 148; as a genus, monotypic for *M. olivacea* Bourguignat.

Aferulus E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 295; as a division of *Cyclophorus* to include *C. elatior* v. Martens, *C. intermedius* v. Martens, *C. hildebrandti* v. Martens, *C. wahlbergi* (Benson), *C. magilensis* Craven, *C. olivaceus* (Bourguignat), and *C. volkensi* v. Martens.

Natalia GODWIN-AUSTEN, 1897, Land and Freshwater Moll. India, II, 7, p. 22; as a subgenus of *Cyclophorus,* monotypic for *Cyclostoma wahlbergi* Benson. Not *Natalia* Gray, 1840.

Hijabia GODWIN-AUSTEN, 1898, *op. cit.,* II, 8, p. 46; new name for *Natalia,* preoccupied.

Austrocyclus ANCEY, 1898, Ann. Musée Marseille, (2) I, 1, p. 136, footnote; as a genus for *C. wahlbergi* (Benson), *C. hildebrandti* v. Martens, and *C. magilensis* Craven; type species not designated.

Cyclophoropsis DAUTZENBERG, 1908, Journ. de Conchyl., LVI, p. 22; as a section of *Cyclophorus,* monotypic for *C. hildebrandti* v. Martens.

The shell is turbinate, narrowly to moderately umbilicate, without spiral sculpture, covered with a thick cuticle which is somewhat lamellose, *the peristome simple,* not expanded or reflected. Operculum thin, horny and many-whorled, as in other *Cyclophori.* Animal with very short, undivided foot, which is rounded behind and extends just beyond the circumference of the operculum.[1] Male organ situated on the center line of the neck, rather nearer to the anus than the tentacles.

Dupuis and Putzeys (1901) describe the eggs of *C. intermedius* as "black, small, and very numerous."

Type: *Maizania olivacea* Bourguignat.

This subgenus is endemic in Africa; it extends along the East Coast from Pondoland to Mt. Kilimanjaro; it reaches the West Coast across Uganda and the Congo Basin and is found in Guinea from Sierra Leone to Angola; also on San Thomé (see the map, Fig. 162).

213. **Cyclophorus (Maizania) intermedius** v. Martens

Cyclophorus intermedius E. v. MARTENS, 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 8, Pl. II, fig. 3. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 210. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 48.

Cyclophorus intermedius v. Martens, var. *cingulatus* DUPUIS AND PUTZEYS, 1901, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXVI, p. xli, figs. 17 and 18 (type locality: Nsendwe; Dupuis Coll.).

The type locality was not designated; it was described from Mjongo (Uganda), the Semliki Forest at 0° 45′ N. lat. and Bugundi (= Buginda) (Stuhlmann Coll.). Island Kwidjwi and plain of the lower Semliki (Schubotz Coll.). Nsendwe (Dupuis Coll.). Vieux Kassongo and Lukonzolwa (Bequaert Coll.).

The variety *cingulatus* Dupuis and Putzeys differs from the type merely "by its feebler size, its less strong striæ and the presence of colored spiral bands." Such specimens are often found together with typical ones in the same locality; v. Martens found them among the original lot from Mjongo.

Stanleyville, Avakubi, Lesse, and Masisi (Bequaert Coll.). Medje (Lang and Chapin Coll.).

All these specimens agree with the description of *C. intermedius* v. Martens. They have cream-buff or paler spiral lines, sometimes few or indistinct, on a ground of cinnamon-brown, with lighter and darker streaks; the apex tawny or some reddish shade. Striation fine; in places there are rather close rib-striæ. Adult specimens measure:

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[1] See Stuhlmann's drawing of living *C. elatior* v. Martens in 1897, Deutsch Ost Afr., IV, Beschalte Weichth., Pl. I, fig. 1.

Altitude	*Diameter*	*Width of Aperture*	
15.8 mm.	20.0 mm.	10.7 mm.	Stanleyville
16.8	20.5	10.3	Stanleyville
16.6	21.0	10.5	
16.2	19.0	9.7	Masisi
12.0	16.5	8.4	Avakubi

The Avakubi shells and one from Lesse are smaller.

The collection contains several other lots differing more or less from true *intermedius;* it will be seen that there is local racial differentiation. Thiele has pointed out that it is difficult to keep *C. intermedius* and *C. elatior* v. Martens separated; "possibly these are only variations of one and the same species, since the somewhat different height of the spire alone differentiates them."

Two lots from the western slope of Mt. Ruwenzori, in the Butagu Valley, at 1800 m. and in the Lamia Valley at 2000 m. (Bequaert Coll.), consist of smaller, more elevated specimens. Where rib striation appears it is more spaced. The apex is ruddy. The number of whorls, 4½, is the same as in the larger shells from further west. The pale spiral lines are rather indistinct.

Altitude	*Diameter*	*Width of Aperture*
13.8 mm.	15.5 mm.	8.0 mm.
12.0	14.0	7.3

Smith identified specimens from the eastern slope of Mt. Ruwenzori (Mobuku Valley at 1800-2300 m.) as *C. elatior* v. Martens.

Numerous specimens from Penge (Bequaert Coll.) are small with the light spirals indistinct. When quite unworn, there are low cuticular laminæ along the rib-striæ, which are more widely spaced than in *C. intermedius cingulatus.*

Altitude	*Diameter*	*Width of Aperture*
10.6 mm.	13.4 mm.	6.3 mm.
12.8	16.0	7.8

Shells from Rutshuru in the forest gallery of the Rutshuru River (Bequaert Coll.) are more depressed, polished, but with spaced rib-striæ on the penult whorl. The umbilicus is larger.[1]

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[1] These specimens remind one of *C. hildebrandti* v. Martens, 1878, Monatsber. Ak. Wiss. Berlin, p. 289, Pl. I, figs. 1-3, described from bleached individuals from Ukanda, German East Africa; in this connection it seems worth mentioning that the specimens from the Semliki Forest and Bugundi on which *C. intermedius* was partly based, were originally identified as *C. hildebrandti* by v. Martens (1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 180). I am inclined to believe that *C. elatior, C. hildebrandti, C. intermedius,* and *C. rugosus* Putzeys are merely variations of a single specific type. Nothing in the distribution of these forms allows one to consider them as geographical races. *C. angolensis* Dohrn (1878, Jahrb. D. Malak. Ges., V, p. 151) from Angola, should also be compared with the preceding [J. B.].

Altitude	*Diameter*	*Width of Aperture*
12.6 mm.	17.0 mm.	8.6 mm.
11.8	16.5	7.8
11.0	17.0	8.3

Specimens from Nsendwe, part of the original lot of *cingulatus,* are rather small, finely striate, resembling those of Penge in size but not in sculpture.

Altitude, 12.2 mm.; diameter, 14.3 mm.; width of aperture, 7 mm.

"In the Congo Basin I have found living specimens of *Cyclophorus* only in the lower humid parts of the forest, most frequently in the swampy wooded banks of the streams, which are periodically subject to inundation. After the flood is gone, the soil of these swampy patches is covered with a layer of very moist decaying leaves mixed with a black, slimy deposit of mud. It is on this muddy substratum that one has to look for *Cyclophorus;* they are, however, rather hard to discover, since in life the shell is as a rule densely coated with a thick adhesive layer of black muddy slime, possibly consisting of excremental matter. Outside the Rain Forest they occur under similar conditions in shady, swampy forest galleries, preferably near sources. On Mt. Ruwenzori I found them under decaying leaves in the deeper ravines with tree ferns of the lower mountain forest. On some occasions living snails could not be detected after careful investigation of a locality where dead and bleached specimens were rather abundant. I have often remarked that the bleached specimens are usually much larger than the ones that are obtained alive" [J. B.].

Other Species of *Cyclophorus* Recorded from the Belgian Congo

Cyclophorus (*Maizania*) *elatior* v. Martens

Cyclophorus elatior E. v. MARTENS, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 180; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 8, Pl. I, fig. 1; Pl. II, fig. 4. E. A. SMITH, 1909, Trans. Zool. Soc. London, XIX, p. 47. J. THIELE, 1911, Wiss. Ergebn. D. Z. Afr. Exp. (1907-08), III, p. 210.

Migere in Butumbi (type locality), Vichumbi, and Bundeko[1] at 750 m. (Stuhlmann Coll.). Fifty kilometers east of Kasongo (Grauer Coll.). Thiele records it also from the Bugoie Forest and Smith from the eastern slope of Mt. Ruwenzori in the Mobuku Valley between 1800 and 2300 m.

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[1] This locality is the same given by v. Martens for *C. intermedius:* "zwischen Ngesi und Mwutan-Nsige im Wald westlich von Issango-Itiri 0° 45′ N." as can be seen in following Stuhlmann's itinerary.

Cyclophorus (*Maizania*) *rugosus* Putzeys

Cyclophorus rugosus PUTZEYS, 1899, Ann. Soc. Malacol. Belgique, Bull. Séances, XXXIV, p. lv, fig. 1.

Type locality: Forest of Micici (Dupuis Coll.).

From the description and figure it is impossible to find any difference between this and *C. elatior*.

CYATHOPOMA W. and H. Blanford

Cyathopoma W. AND H. BLANFORD, 1861, Journ. Asiatic Soc. Bengal, XXX, p. 348. W. BLANFORD, 1864, Ann. Mag. Nat. Hist., (3) XIII, p. 449. Type by original designation *Cyclostoma filocinctum* Benson.

Shell turbinate, small, umbilicate, with spiral sculpture, covered with a thick cuticle. The multispiral operculum is convex and horny internally; externally it is concave, calcareous, with an erect spiral lamina on the whorls, the rather large nucleus smooth.

An Oriental Region genus, with numerous species in Japan, India, and Ceylon. One has been described from the Nicobar Islands and another from the Seychelles. The species described below differs from the above generic diagnosis by having no conspicuous periostracum.

214. **Cyathopoma africanum,** new species

Ituri Forest: Avakubi, 2 specimens found in decaying leaves on the soil of the Rain Forest (Bequaert Coll.).

The shell (Fig. 163) is turbinate, openly umbilicate, dirty pale buff. The apex is mammillate, the first whorl standing out though depressed at the apex, next whorl spreading. The first two whorls are convex, microscopically pitted-reticulate. The following whorls have coarse spiral threads and very close minute vertical striæ. The last whorl is biangular, the penult angular in the middle. There are four threads above the upper angle, three between the angles, and five on the base, some smaller threads revolving in the umbilicus. The vertical striæ grow out into long processes, adhering in groups, on the two peripheral keels and that bounding the umbilicus, but in the adult stage, these are mostly worn away. The aperture is subcircular, the inner margin being decidedly less convex than the outer. There is a thin inner rim bordered by a broad, radially fluted expansion, which is much narrower on the columellar than on the other margins.

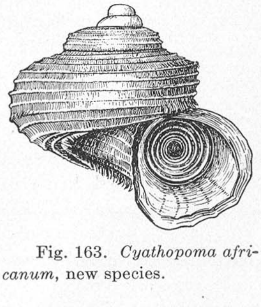

Fig. 163. *Cyathopoma africanum*, new species.

Altitude, 2.5 mm.; diameter, 2.7 mm.; 4⅓ whorls.

The operculum does not retract far within. The outer face is somewhat concave. Its whorls are narrow, about six outer ones bearing an erect spiral lamina.

This little snail is more strongly sculptured than any I have seen of the Oriental species of the genus. The broad expansion of the peristome gives it the appearance of a miniature *Tropidophora.*

DITROPIS W. Blanford

Ditropis W. BLANFORD, 1869, Journ. Asiatic Soc. Bengal, XXXVIII, p. 126; as a subgenus of *Cyclophorus;* type by original designation: *Cyclophorus* (*Ditropis*) *planorbis* W. Blanford.

Shell small, transparent, nearly hyaline, with a smooth cuticle; the last whorl with spiral keels, of which at least two are usually present, one on the middle and one below. Operculum horny, narrowly whorled, consisting of two plates which are separated by a marginal fissure (Kobelt).

This Oriental Region genus extends over Malaya and India. The following African species has been referred with some doubt to *Ditropis* by v. Martens.

Ditropis (?) *papillaris* (v. Martens)

Cyclophorus (*Ditropis?*) *papillaris* E. v. MARTENS, 1892, Sitz. Ber. Ges. naturf. Fr. Berlin, p. 180; 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 9, Pl. II, fig. 7.

Type locality: Migere in Butumbi on the south shore of Lake Albert Edward in moist humus of the Rain Forest (Stuhlmann Coll.).

This snail has never been found since. It is very small (altitude, 1.5 mm.; largest diameter, 3.25 mm.) and has two projecting spiral keels; between, above and below them are several other spiral threads. The operculum is described as "thin, with numerous whorls" which does not seem to agree well with the characters of the Oriental species of *Ditropis.*

Pomatiasidæ

(CYCLOSTOMATIDÆ of authors)

Terrestrial operculate snails with the shell of various shape, the aperture circular. Operculum calcareous, solid, with a small number of increasing whorls and a subeccentric nucleus. Pallial cavity transformed into a lung. A deep longitudinal pedal groove present. No jaws.

TROPIDOPHORA Troschel

Tropidophora TROSCHEL, 1847, Zeitschr. f. Malak., IV, p. 44; for *Cyclostoma cuvierianum* Petit and *C. tricarinatum* Lamarck, both from Madagascar. CONNOLLY, 1912, Ann. South Afr. Mus., XI, 3, p. 252; *C. cuvierianum* designated as type.

Eutropidophora KOBELT AND V. MÖLLENDORFF, 1898, Nachrichtsbl. D. Malak. Ges., XXX, p. 158.

The original diagnosis of this genus is as follows: "Operculum flat; with 4 to 5 whorls, gradually increasing in width. Shell depressed or top-shaped, with one or more lamelliform raised keels. Peristome simple, expanded, touching the penult whorl, nearly entire, covering more or less the umbilicus."

The only species which occurs in the Belgian Congo, *T. anceps* (v. Martens), is turbinately conical with spiral threads in the subsutural and umbilical regions, the middle zone of the whorls being without carinæ. It measures about 26 mm. altitude × 25 mm. diameter.

Tropidophora, in Troschel's sense, includes numerous species from Madagascar, Mauritius, Réunion, the Comoros and Seychelles. A few species are found in East Africa from Port Elizabeth to Zanzibar Island and Mt. Kilimanjaro; they occur in Pondoland, Natal, Zululand, Portuguese and German East Africa, Nyasaland, North East Rhodesia, and the Katanga.

Kobelt and v. Möllendorff[1] include most, but not all, of the East and South African "Cyclostomidæ" in *Ligatella* v. Martens,[2] with which they synonymize *Rochebrunnia* Bourguignat[3]; and Connolly has followed their example.[4]

Tropidophora (*Ligatella*) *anceps* (v. Martens)

Cyclostoma anceps E. v. MARTENS, 1878, Monatsber. Ak. Wiss. Berlin, p. 288, Pl. I, fig. 4 (type locality: Taita, German East Africa); 1897, Deutsch Ost Afr., IV, Beschalte Weichth., p. 3.

Tropidophora anceps v. Martens. DAUTZENBERG AND GERMAIN, 1914, Rev. Zool. Afric., IV, p. 47.

Kapoya (between Kiambi and Sampwe; Bequaert Coll.).

"At Kapoya, a village about 90 km. south of Kiambi, at 800 m., a single specimen of this snail was found, in November 1911 (rainy season), crawling over the ground, between the short grass of the tree savannah. A second specimen was collected under similar conditions at Kiniama, a village about 40 km. southeast of Kiambi, at 750 m. These were the only specimens seen during one and a half years collecting in the Katanga. Both localities are situated about 28° E. long., and interesting because they are the most western records for any African species of *Tropidophora*" [J. B.].

This species is commonly found throughout German East Africa.

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[1] 1898, Nachrichtsbl. D. Malak. Ges., XXX, pp. 158 and 177.

[2] 1880, in Möbius, Beiträge Meeresfauna Mauritius, p. 187; type: *Nerita ligata* Müller.

[3] 1881 Février , Moll. terr. et fluv. recueillis en Afrique dans le Pays des Çomalis, p. 7; type: *Otopoma obtusum* Pfeiffer.

Kobelt and v. Möllendorff, in their list of terrestrial Operculata (1898, *loc. cit.*), indicate *Tropidophora moreleti* Kobelt (=*anaglyptum* Morelet, 1890) from "Westafrika." It is worth mentioning that this is an error; no locality is given in the original description. The locality of *T. æquatoria* Morelet, Tabora, is also erroneously placed by Kobelt and v. Möllendorff in "Westafrika." No "Cyclostomatidæ" are known thus far from West Africa [J. B.].

EXPLANATION OF PLATES I-XXIII

PLATE I

Figs. 1 and 2. *Limicolaria saturata chromatica* Pilsbry. Butagu Valley.

Fig. 3. *Achatina bandeirana* Morelet. Kunga.

Fig. 4. *Achatina schweinfurthi* v. Martens. Niangara.

Fig. 5. *Limicolaria saturata chromatica* Pilsbry. Butagu Valley; mutant without brown pigment, occurring together with the specimens of figs. 1 and 2.

All natural size.

PLATE II

Figs. 1 to 3. *Achatina schweinfurthi rhodacme* Pilsbry. Stanleyville; × ¾.

PLATE III

Figs. 1 and 2. *Limicolariopsis ruwenzoriensis* Pilsbry. Lanuri Valley; fig. 1 is the type.

Fig. 3. *Achatina schweinfurthi rhodacme* Pilsbry, mutation *levior* Pilsbry. Stanleyville; type.

Fig. 4. *Achatina schweinfurthi rhodacme* Pilsbry, mutation *rhodostemma* Pilsbry. Stanleyville; type.

Figs. 5 and 6. *Limicolariopsis ruwenzoriensis* Pilsbry. Lanuri Valley.

All natural size.

PLATE IV

Figs. 1, 2, and 3. *Limicolaria subconica germaini* (C. R. Bœttger). Moanda.

Fig. 4. *Achatina tincta* Reeve; typical pattern. Malela.

Fig. 5. *Bocageia interioris* Pilsbry. Lanuri Valley; type.

Fig. 6. *Achatina osborni* Pilsbry. Masisi; type.

Figs. 7 and 8. *Homorus castaneus* (v. Martens). Butagu Valley.

All natural size.

PLATE V

Figs. 1 and 1*a*. *Burtoa nilotica emini* (v. Martens). Boswenda.

Figs. 2 and 3. *Achatina tincta* Reeve, mutation *oblitterata* (Dautzenberg). Malela.

All natural size.

PLATE VI

Figs. 1 to 11. *Perideriopsis fallsensis* Dupuis and Putzeys; mutations from Stanleyville.

Fig. 12. *Limicolaria lucalana* Pilsbry; narrow-striped mutation from Bolengi.

All natural size.

PLATE VII

Figs. 1 and 1*a*. *Pleuroprocta silvatica* Pilsbry; type specimen from Lesse.

Fig. 2. *Pleuroprocta silvatica* Pilsbry; specimen from Medje.

Figs. 3 and 3*a*. *Pleuroprocta silvatica walikalensis* Pilsbry; type specimen. Walikale.

Figs. 4 and 4*a*. *Lævicaulis schnitzleri* (Simroth). Rutshuru.

Figs. 5 and 5*a*. *Pleuroprocta silvatica* Pilsbry; young specimen from Medje; about three times natural size; not 3.15 mm. long as stated on the plate.

Figs. 6, 7, and 8. *Limicolaria saturata masisiensis* Pilsbry. Masisi.

Figs. 9 and 10. *Limicolaria saturata capitellum* Pilsbry. Medje.

Figs. 1 to 5*a* enlarged, the others natural size.

PLATE VIII

Figs. 1 and 2. *Atoxon brunneum* Simroth; length, 45 mm. Butagu Valley.

Fig. 3. *Atoxon faradjense* Pilsbry; length, 40 mm. Faradje; type.

Fig. 4. *Bukobia cockerelli* Pilsbry; length, 37 mm. Butagu Valley; type.

Fig. 5. *Dendrolimax osborni* Pilsbry; length, about 35 mm. Rutshuru; type.

Fig. 6. *Atoxon flavum rutshuruense* Pilsbry; length, 30 mm. Rutshuru; type.

Fig. 7. *Trichotoxon pollonerœ* Pilsbry; length, 43 mm. Medje; type.

Fig. 8. *Trichotoxon ruwenzoriense* Pilsbry; length, 65 mm. Lanuri Valley; type.

Fig. 9. *Trichotoxon maculatum perforatum* Pilsbry; length, 58 mm. Rutshuru; type.

Fig. 10. *Trichotoxon pardus* Pilsbry; length, 57 mm. Butagu Valley; type.

Figs. 5, 8 to 10 natural size, the others enlarged.

PLATE IX

Figs. 1 to 7. *Achatina schweinfurthi rhodacme* Pilsbry. Stanleyville; figs. 4 to 7 are the narrow-mouthed form; × ½.

PLATE X

Fig. 1. *Achatina schweinfurthi rhodacme* Pilsbry. Stanleyville; living immature specimen.

Figs. 2 and 3. *Ledoulxia mozambicensis* (Pfeiffer); two views of a colony under the leaf sheaths of bananas. Faradje.

Photographs by H. Lang.

PLATE XI

Fig. 1. Logo woman wearing a necklace made from shell disks of Achatinidæ and human teeth. Faradje.

Fig. 2. Strings of beads made of shell disks of Achatinidæ, worn around the hip. Logo, Faradje.

Photographs by H. Lang.

PLATE XII

Figs. 1 and 2. *Burtoa nilotica obliqua* (v. Martens). Stanleyville.

Natural size.

PLATE XIII

Figs. 1 and 1*b*. *Limicolaria walkeri* Pilsbry. Mobeka; fig. 1*b* is the type.

Fig. 1*a*. *Limicolaria walkeri* mutation *nudata* Pilsbry. Mobeka.

Figs. 2, 2*a*, and 2*b*. *Achatina weynsi* Dautzenberg. Nouvelle Anvers.

All natural size.

PLATE XIV

Fig. 1. *Limicolaria festiva* mutation *clara* Pilsbry; large form. Five hours north of Faradje.

Fig. 2. *Achatina weynsi* mutation *rosaxis* Pilsbry. Nouvelle Anvers.

Figs. 3, 4, and 5. *Limicolaria festiva* mutation *clara* Pilsbry. Five hours north of Faradje. Fig. 5 represents the type of the mutation *clara.*

All natural size.

PLATE XV

Figs. 1 to 3, 5, and 6. *Limicolaria festiva* (v. Martens). Five hours north of Faradje.

Fig. 4. *Limicolaria festiva* (v. Martens). Niangara.

All natural size.

PLATE XVI

Figs. 1 to 6. *Limicolaria distincta* Putzeys. Stanleyville.

Figs. 7 to 12. *Limicolaria læta medjensis* Pilsbry. Medje; fig. 8 is the type.

All natural size.

PLATE XVII

Fig. 1. *Homorus kwidschwiensis nigricans* Pilsbry. Masisi; type.

Fig. 2. *Homorus osborni* Pilsbry. Zambi; type.

Fig. 3. *Homorus alberti* Pilsbry. Medje; type.

Fig. 4. *Homorus langi* Pilsbry. Zambi; type.

Fig. 5. *Homorus ischnus* Pilsbry. Avakubi; type.

Figs. 6 and 6*a*. *Homorus bequaerti* Pilsbry. Fig. 6 is the type from the Butagu Valley; fig. 6*a* is from a Lanuri Valley shell.

Figs. 7 and 7*a*. *Homorus olivaceus* Pollonera. Butagu Valley.

Figs. 8 to 10*a*. *Homorus amputatus* Pilsbry. Medje; fig. 8 is the type.

Figs. 11 and 11*a*. *Homorus clarus* Pilsbry. Rutshuru.

Fig. 12. *Homorus clarus* Pilsbry; stout form. Rutshuru.

Figs. 13 and 14. *Homorus amputatus* Pilsbry; large form. Medje.

PLATE XVIII

Figs. 1 and 1*a*. *Pseudoglessula walikalensis* Pilsbry. Walikale.

Figs. 2 and 2*a*. *Pseudoglessula intermedia masisiensis* Pilsbry. Mbisi.

Fig. 3. *Pseudoglessula leopoldvillensis* Pilsbry. Leopoldville; type.

Fig. 4. *Pseudoglessula hessei* (C. R. Bœttger). Zambi.

Fig. 5. *Pseudoglessula umbilicata* Pilsbry. Rutshuru; type.

Fig. 6. *Pseudoglessula famelica* Pilsbry. Penge; type.

Figs. 7 and 7*a*. *Pseudoglessula gracillima* Pilsbry. Medje.

Fig. 8. *Pseudoglessula subfuscidula* Pilsbry. Penge; type.

Fig. 9. *Pseudoglessula cruda* Pilsbry. Penge; type.

Fig. 10. *Subulina glyptocephala* Pilsbry. Thysville; type.

Figs. 11 and 11*a*. *Subulina avakubiensis* Pilsbry, and penult whorl more enlarged. Avakubi; type.

Figs. 12 and 12*a*. *Subulina thysvillensis* Pilsbry, and penult whorl more enlarged. Thysville; type.

PLATE XIX

Fig. 1. *Nothapalus paucispira xanthophaes* Pilsbry. Avakubi; type.

Fig. 2. *Nothapalus paucispira xanthophaes* Pilsbry, inside of epiphragm and egg.

Fig. 3. *Nothapalus sororcula* Pilsbry. Butagu Valley; type.

Fig. 4. *Nothapalus ptychoraphe* Pilsbry. Kisuki; type.

Fig. 5. *Nothapalus cœlatus debilis* Pilsbry. Lanuri Valley; type.

Fig. 6. *Nothapalus cœlatus* Pilsbry. Lamia Valley; type.

Figs. 7 and 7*a*. *Subulina gratacapi* Pilsbry, and seventh whorl more enlarged. Thysville; type.

Figs. 8 to 10. *Subuliniscus ruwenzorensis* (Pollonera); fig. 9 is a young shell, 6.3 mm. long. Butagu Valley.

Fig. 11. *Subulina lowei* Pilsbry. Medje; type.

Fig. 12. *Subulina pengensis* Pilsbry. Penge; type.

Fig. 13. *Bocageia interioris* Pilsbry; early whorls much enlarged. Lamia Valley.

Figs. 14 and 15. *Subulina bequaerti* Pilsbry. Butagu Valley; type.

PLATE XX

Figs. 1 and 1*a*. *Curvella dautzenbergi* Pilsbry. Butagu Valley.

Fig. 2. *Curvella bathytoma* Pilsbry. Mbisi; type.

Figs. 3, 4, and 4*a*. *Curvella langi* Pilsbry. Penge.

Figs. 5 and 5*a*. *Curvella thysvillensis* Pilsbry. Thysville.

Fig. 6. *Curvella chapini* Pilsbry. Medje; type.

Fig. 7. *Pseudopeas thysvillense* Pilsbry. Thysville; type.

Figs. 8 and 8*a*. *Pseudopeas curvelliforme* Pilsbry. Rutshuru.

PLATE XXI

Fig. 1. *Streptostele zambiensis* Pilsbry. Zambi; type.

Fig. 2. *Streptostele leopoldvillensis* Pilsbry. Leopoldville: type.

Fig. 3. *Streptostele langi* Pilsbry. Medje; type.

Fig. 4. *Streptostele bequaerti* Pilsbry. Luvunu; type.

Figs. 5 and 5*a*. *Streptostele centralis* Pilsbry. Penge.

Figs. 6 and 6*a*. *Streptostele horei* Smith. Stanleyville.

Fig. 7. *Streptostele dautzenbergi* Pilsbry. Penge; type.

Fig. 8. *Streptostele centralis coloba* Pilsbry. Penge; type.

Fig. 9. *Streptostele bacillum* Pilsbry. Penge; type.

Fig. 10. *Streptostele teres* Pilsbry. Lanuri Valley; type.

Fig. 11. *Streptostele musæcola* (Morelet). Stanleyville.

PLATE XXII

Figs. 1 and 1*a*. *Mesafricarion maculifer* Pilsbry; type specimen from Stanleyville.

Fig. 2. *Mesafricarion maculifer* Pilsbry. Lanuri Valley.

Fig. 3. *Helixarion niger* Pilsbry; type specimen; left side, the shell removed; the left shell lobe is turned down over the foot. Masisi.

Fig. 4. *Helixarion insularis* (Thiele); two individuals from Rutshuru, showing left (upper) and right (lower) sides; shell removed.

Fig. 5. *Mesafricarion putzeysi* Pilsbry; type specimen; right side. Stanleyville.

Fig. 6. *Helixarion bequaerti* Pilsbry; type specimen; pallial organs from below; left shell lobe below on right. Walikale.

Figs. 7 and 7*a*. *Helixarion insularis* (Thiele); variety from Penge.

Figs. 8 and 8*a*. *Gymnarion aloysii-sabaudiæ* (Pollonera). Medje.

Fig. 9. *Helixarion bequaerti* Pilsbry; left side of type specimen; the shell removed. Walikale.

Fig. 10. *Helixarion ruwenzoriensis* Pilsbry; right side of type specimen, the shell removed; the right shell lobe is turned downward. Lamia Valley.

All figures from photographs of alcoholic specimens.

PLATE XXIII

Figs. 1 to 4. *Cerastus bequaerti* Pilsbry. Masisi.

Figs. 5 and 6. *Cerastus bequaerti mokotoensis* Pilsbry. Mokoto; fig. 6 is the type.

Fig. 7. *Cerastus lucasi* Pilsbry. Masisi; type.

Fig. 8. *Pachnodus spiraxis* Pilsbry. Kilo; type.

Fig. 9. *Bocageia germaini* Pilsbry. Butagu Valley.

Fig. 10. *Succinea bequaerti* Pilsbry. Kabare; type; X 4.

Fig. 11. *Succinea lessensis* Pilsbry. Lesse; type; X 4.

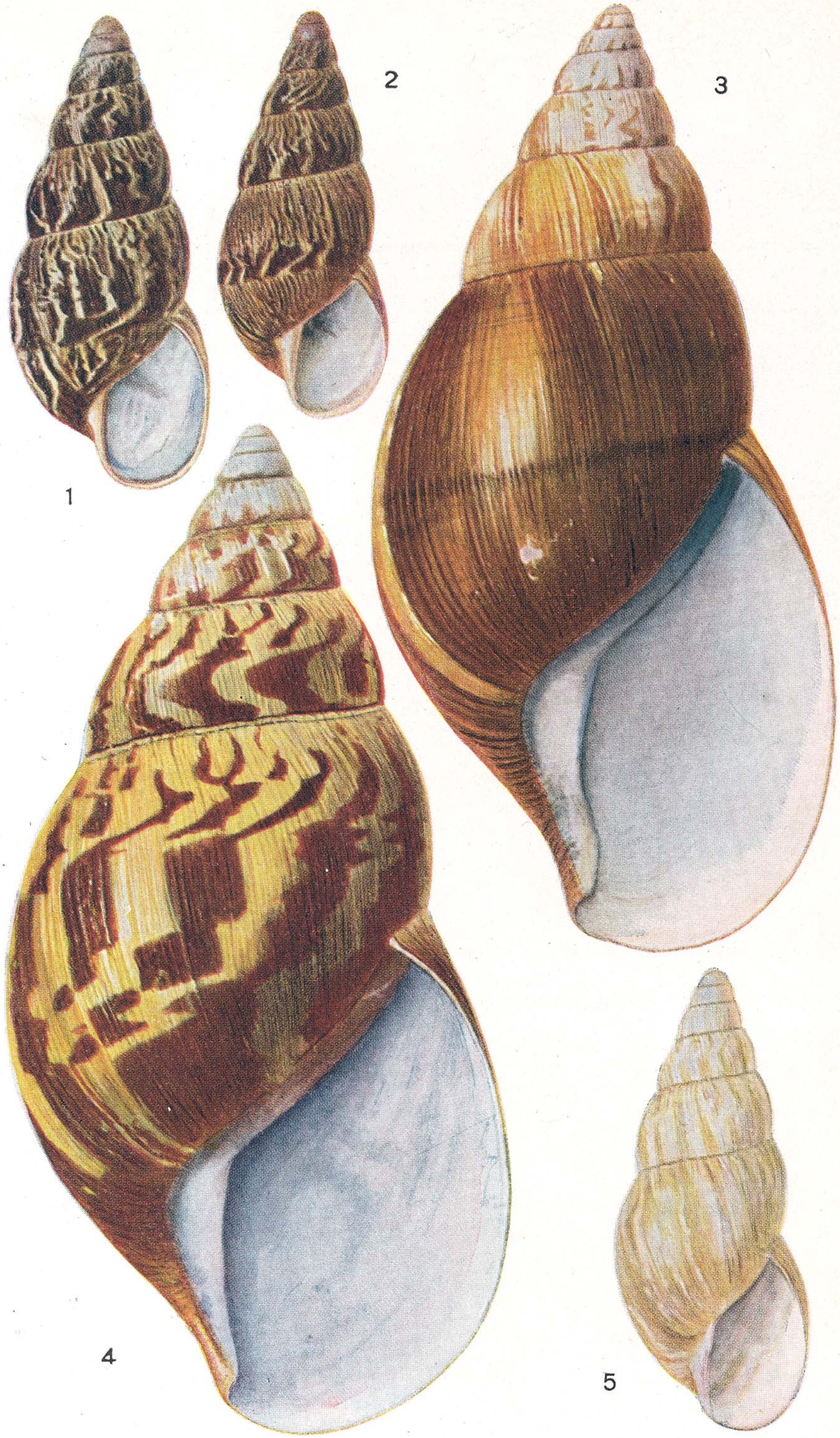
Fig. 12. *Succinea congoensis* Pilsbry. Zambi; type; X 4.

Fig. 13. *Varicostele rutshuruensis* Pilsbry. Rutshuru; type.

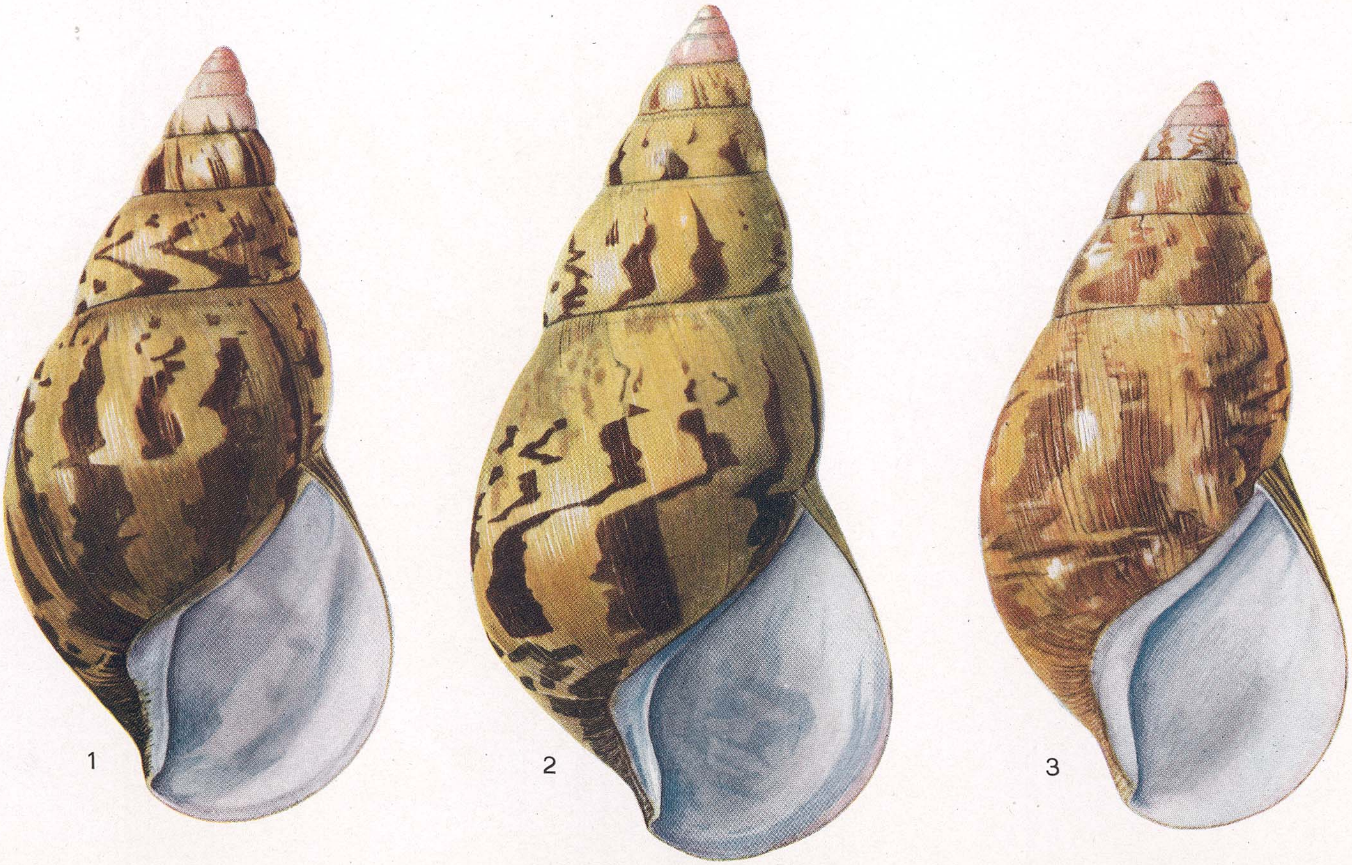
Fig. 14. *Varicostele lessensis* Pilsbry. Lesse; type.

Fig. 15. *Varicostele subvaricosa* (v. Martens). Butagu Valley.

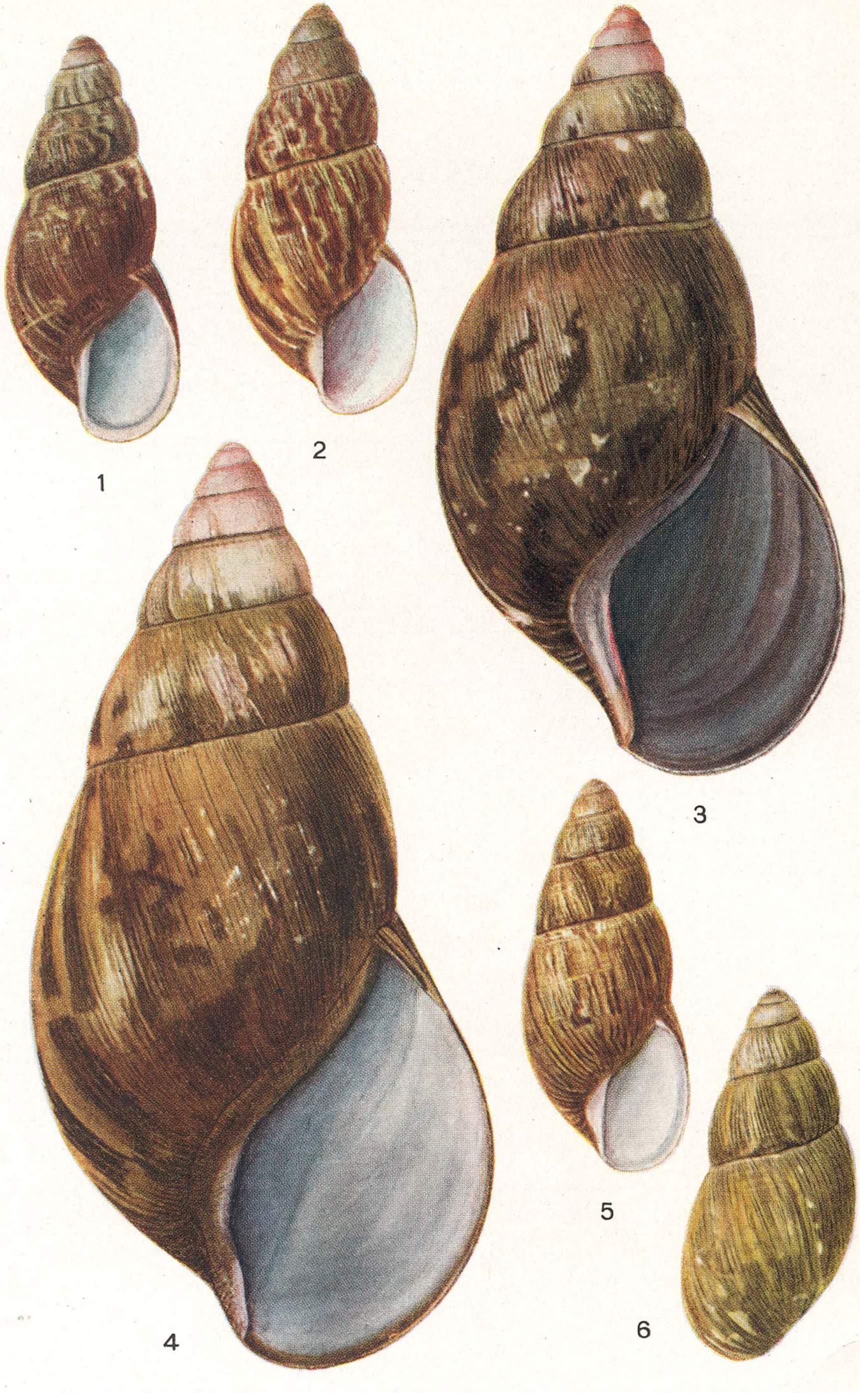
Fig. 16. *Varicostele subvaricosa major* Pilsbry. Butagu Valley; type.



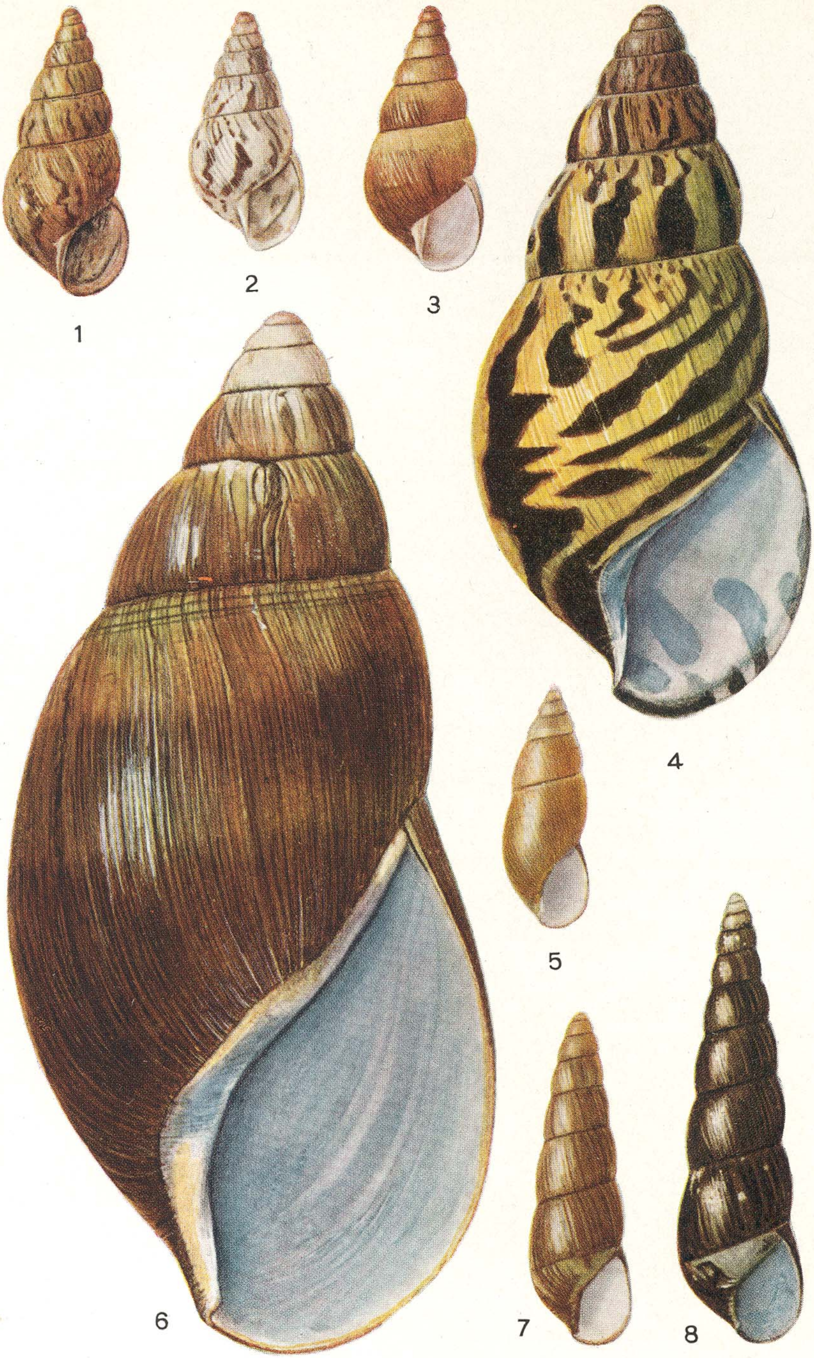
Figs. 1 and 2. *Limicolaria saturata chromatica* Pilsbry. Butagu Valley.
Fig. 3. *Achatina bandeirana* Morelet. Kunga.
Fig. 4. *Achatina schweinfurthi* v. Martens. Niangara.
Fig. 5. *Limicolaria saturata chromatica* Pilsbry. Butagu Valley; mutant without brown pigment, occurring together with the specimens of Figs. 1 and 2.
All natural size.



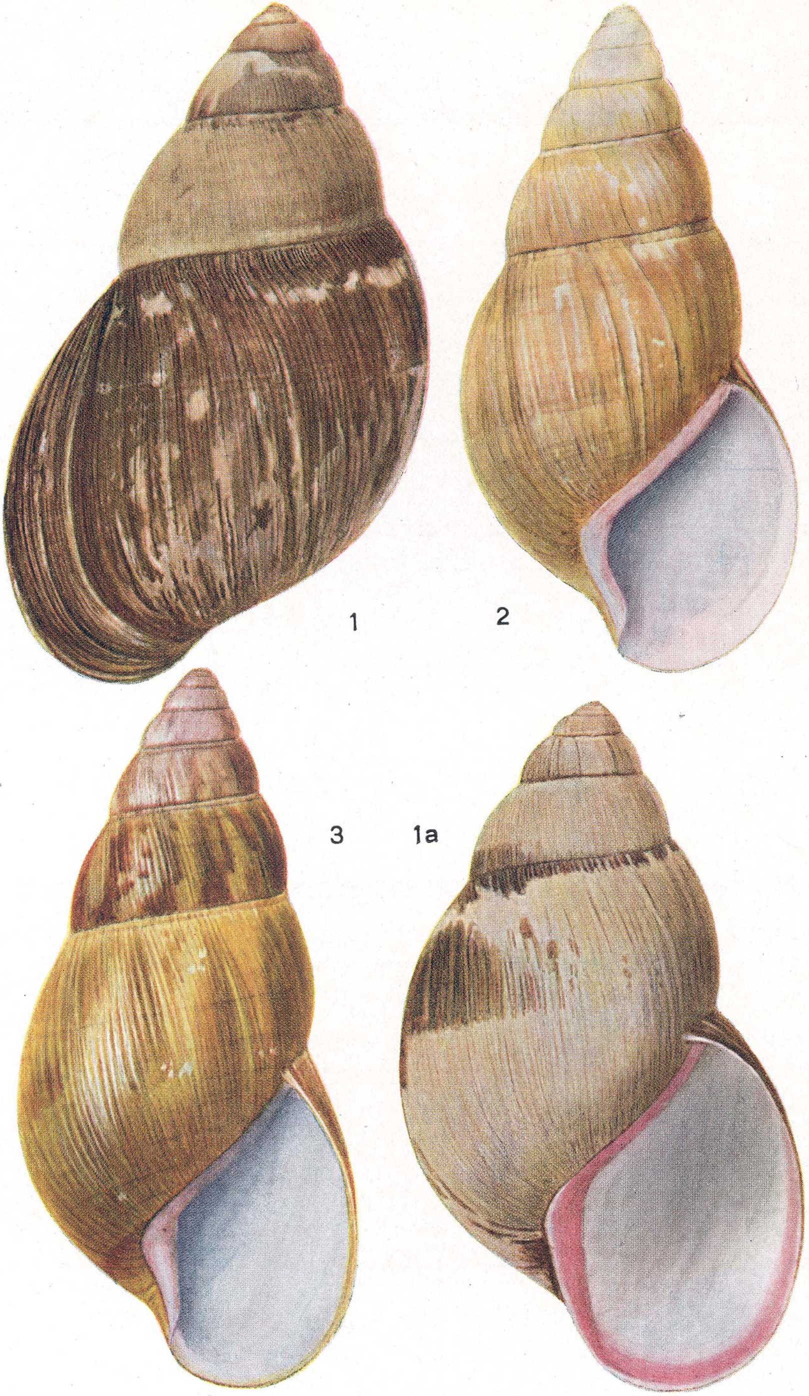
Figs. 1 to 3. *Achatina schweinfurthi rhodacme* Pilsbry. Stanleyville; ¾.



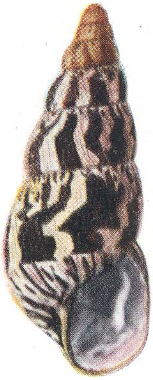
Figs. 1 and 2. *Limicolariopsis ruwenzoriensis* Pilsbry. Lanuri Valley; Fig. 1 is the type.
Fig. 3. *Achatina schweinfurthi rhodacme* Pilsbry, mutation *levior* Pilsbry; Stanleyville; type.
Fig. 4. *Achatina schweinfurthi rhodacme* Pilsbry, mutation *rhodostemma* Pilsbry. Stanleyville; type.
Figs. 5 and 6. *Limicolariopsis ruwenzoriensis* Pilsbry. Lanuri Valley.
All natural size.



Figs. 1, 2, and 3. *Limicolaria subconica germaini* (C. R. Bœttger). Moanda.
Fig. 4. *Achatina tincta* Reeve; typical pattern. Malela.
Fig. 5. *Bocageia interioris* Pilsbry. Lanuri Valley; type.
Fig. 6. *Achatina osborni* Pilsbry. Masisi; type.
Figs. 7 and 8. *Homorus castaneus* (v. Martens). Butagu Valley.
All natural size.



Figs. 1 and 1*a*. *Burtoa nilotica emini* (v. Martens). Boswenda.
Figs. 2 and 3. *Achatina tincta* Reeve, mutation *oblitterata* (Dautzenberg). Malela.
All natural size.



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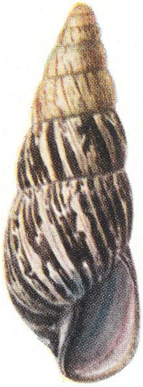

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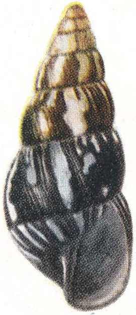

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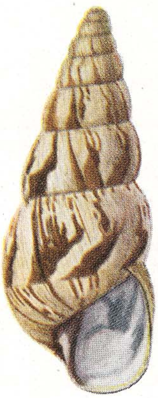

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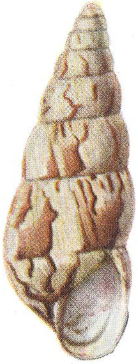

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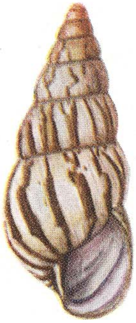

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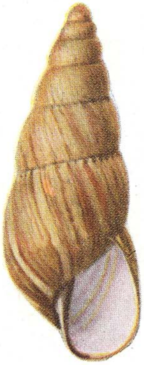

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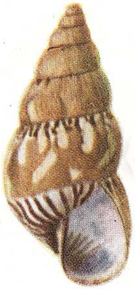

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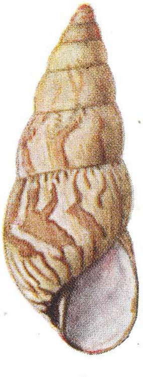

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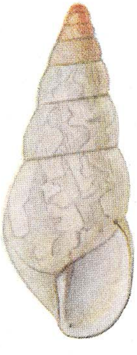

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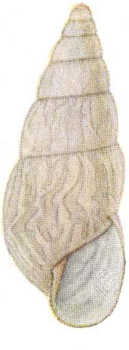

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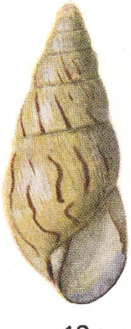
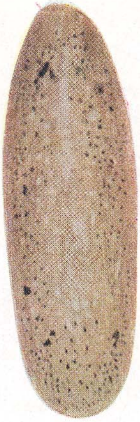


12

Figs. 1 to 11. *Perideriopsis fallsensis* Dupuis and Putzeys; mutations from Stanleyville.
Fig. 12. *Limicolaria lucalana* Pilsbry; narrow-striped mutation from Bolengi.
All natural size.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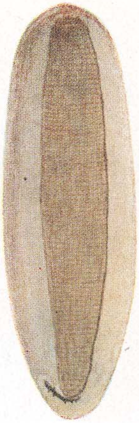
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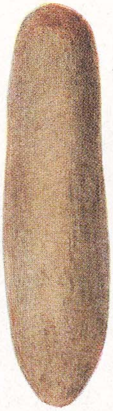
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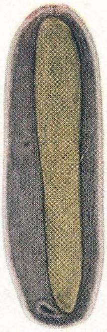
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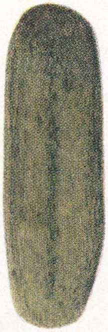
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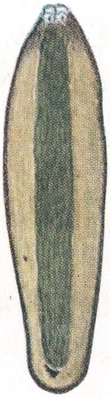
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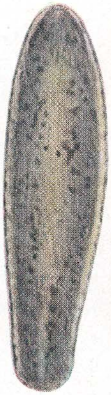
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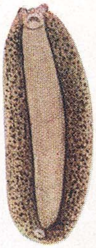
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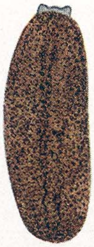
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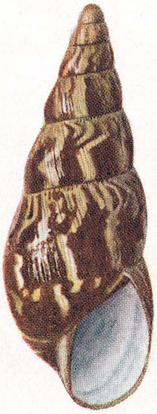
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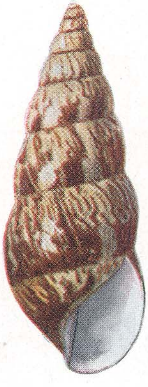
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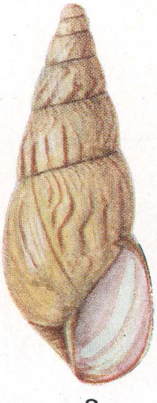
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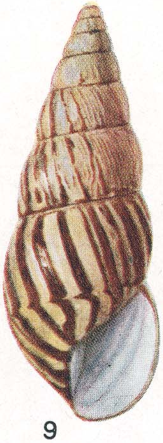
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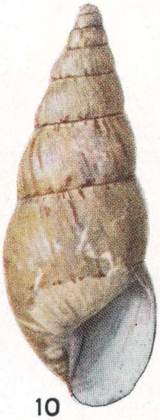
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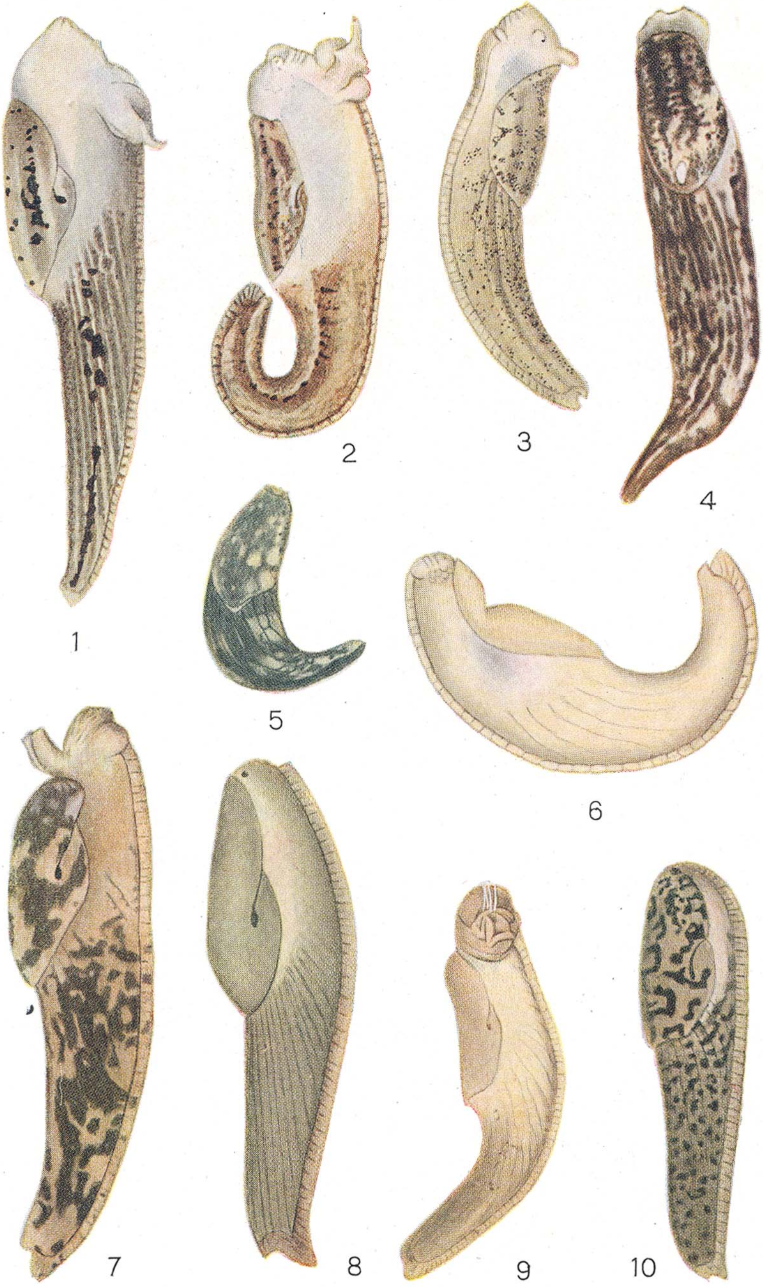
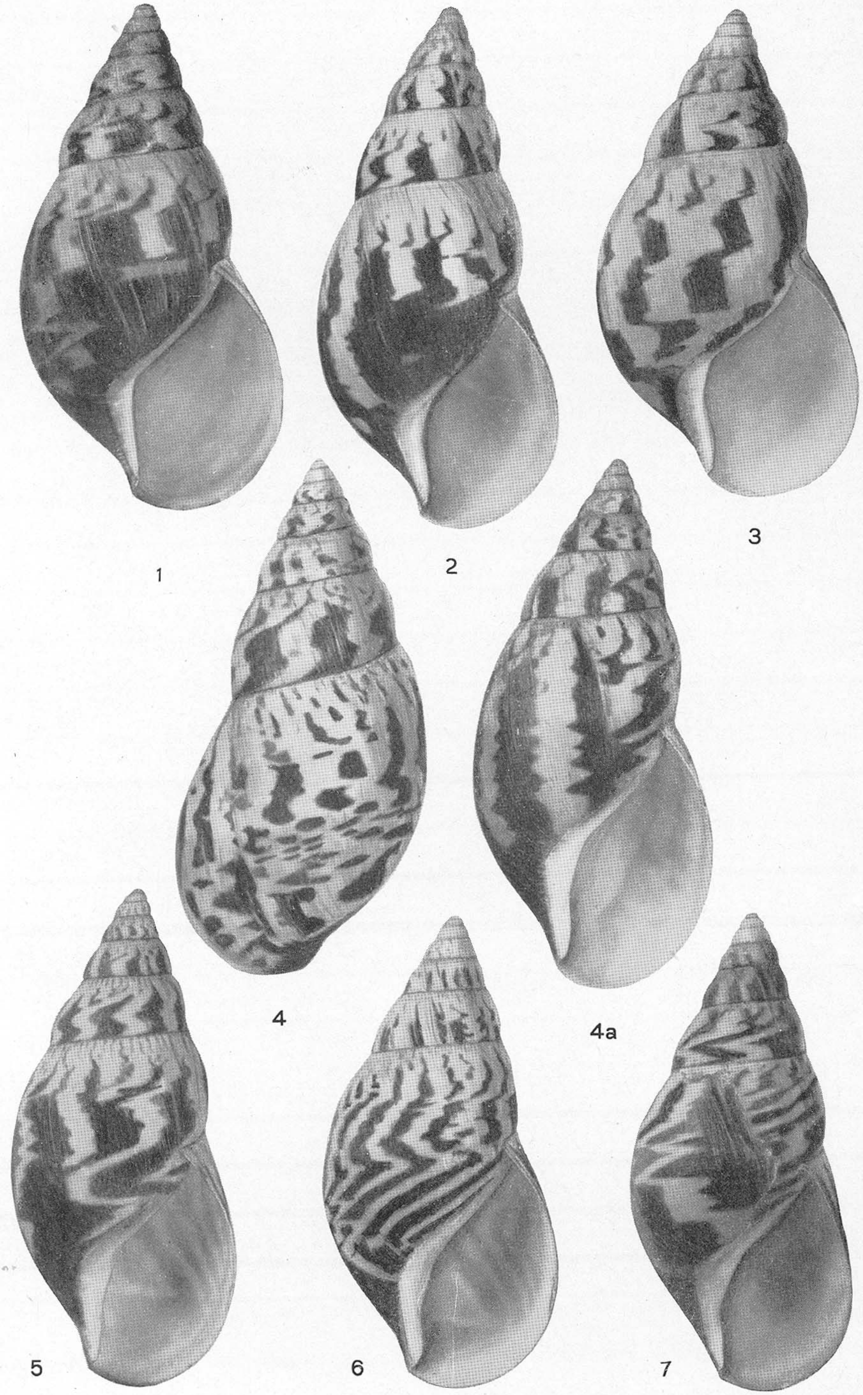
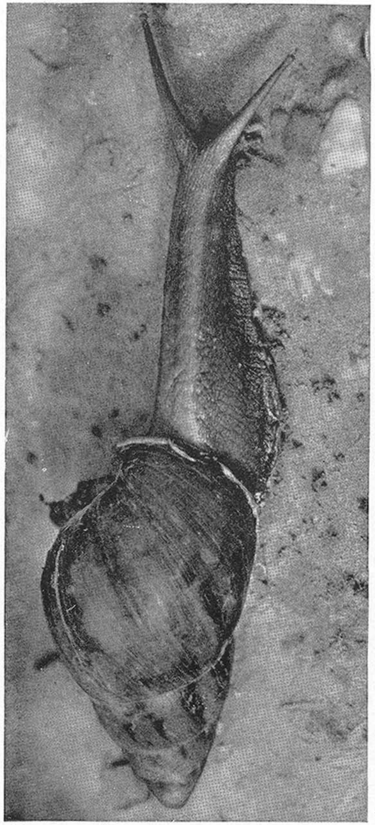
Figs. 1 and 1*a*. *Pleuroprocta silvatica* Pilsbry; type specimen, from Lesse.
Fig. 2. *Pleuroprocta silvatica* Pilsbry; specimen from Medje.
Figs. 3 and 3*a*. *Pleuroprocta silvatica walikalensis* Pilsbry; type specimen. Walikale.
Figs. 4 and 4*a*. *Lœvicaulis schnitzleri* Simroth. Rutshuru.
Figs. 5 and 5*a*. *Pleuroprocta silvatica* Pilsbry; young specimen from Medje; length, 31.5 mm.
Figs. 6, 7, and 8. *Limicolaria saturata masisiensis* Pilsbry. Masisi.
Figs. 9 and 10. *Limicolaria saturata capitellum* Pilsbry. Medje.
All natural size.



Figs. 1. and 2. *Atoxon brunneum* Simroth; length, 45 mm. Butagu Valley.
Fig. 3. *Atoxon faradjense* Pilsbry; length, 40 mm. Faradje; type.
Fig. 4. *Bukobia cockerelli* Pilsbry; length, 37 mm. Butagu Valley; type.
Fig. 5. *Dendrolimax osborni* Pilsbry; length, about 35 mm. Rutshuru; type.
Fig. 6. *Atoxon flavum rutshuruense* Pilsbry; length, 30 mm. Rutshuru; type.
Fig. 7. *Trichotoxon pollonerœ* Pilsbry; length, 43 mm. Medje; type.
Fig. 8. *Trichotoxon ruwenzoriense* Pilsbry; length, 65 mm. Lanuri Valley; type.
Fig. 9. *Trichotoxon maculatum perforatum* Pilsbry; length, 58 mm. Rutshuru; type.
Fig. 10. *Trichotoxon pardus* Pilsbry; length, 57 mm. Butagu Valley; type.
All natural size.



Figs. 1 to 7. *Achatina schweinfurthi rhodacme* Pilsbry. Stanleyville; figs. 4 to 7 are the narrow-mouthed form; × ½.



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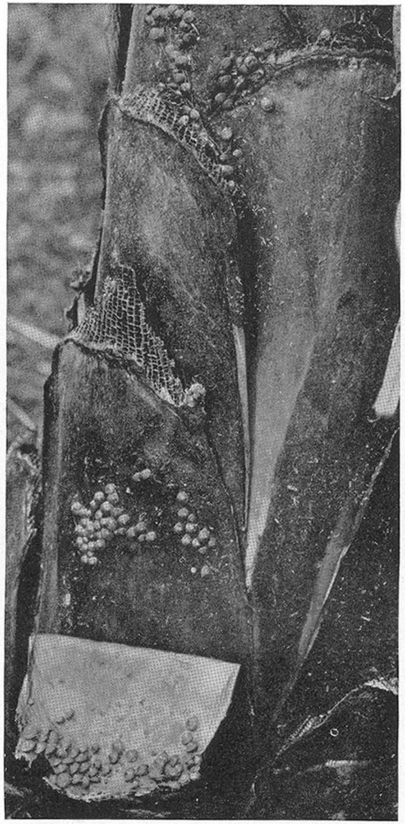

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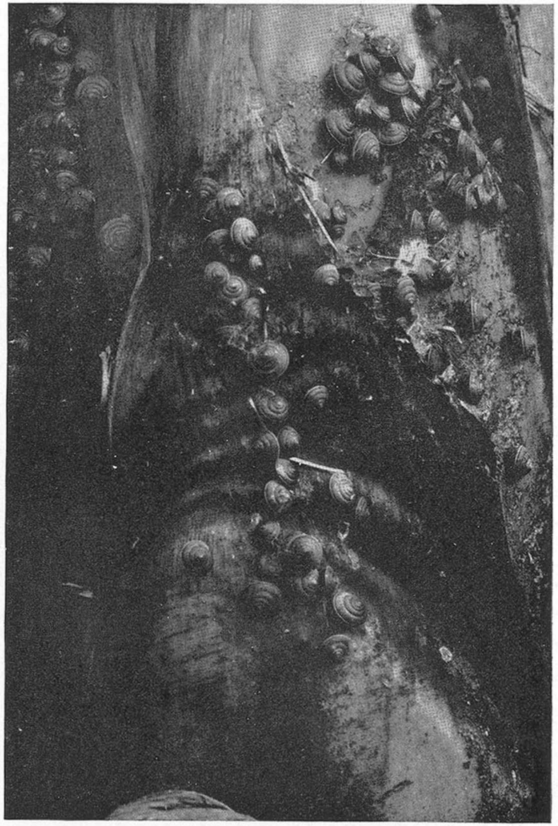

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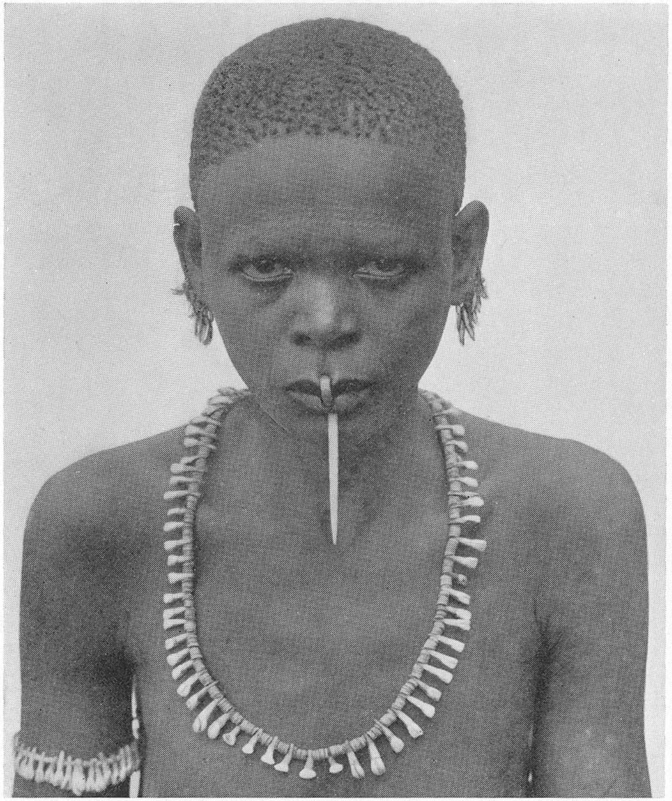
Fig. 1. *Achatina schweinfurthi rhodacme* Pilsbry. Stanleyville; living immature specimen.
Figs. 2 and 3. *Ledoulxia mozambicensis* (Pfeiffer); two views of a colony under the leaf sheaths of bananas. Faradje.
Photographs by H. Lang.



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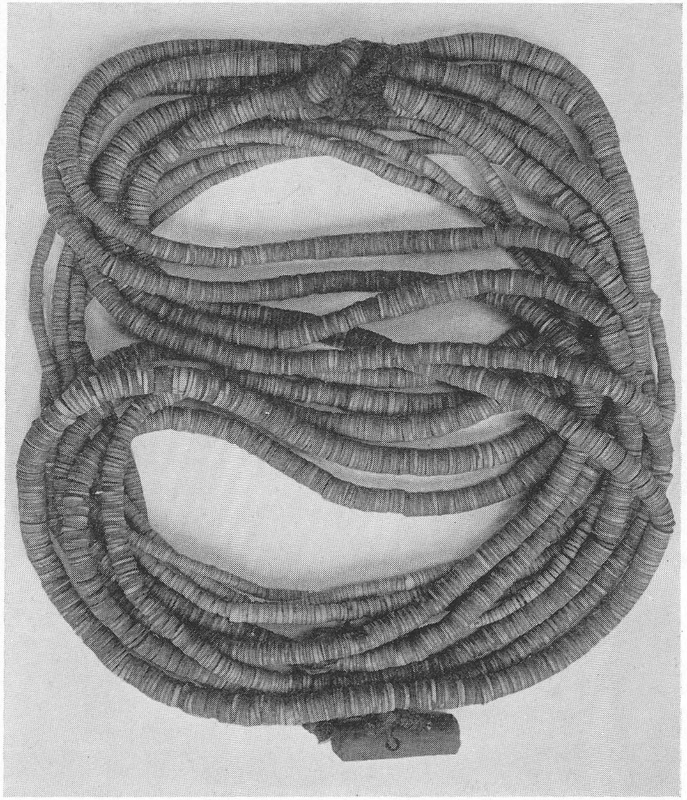
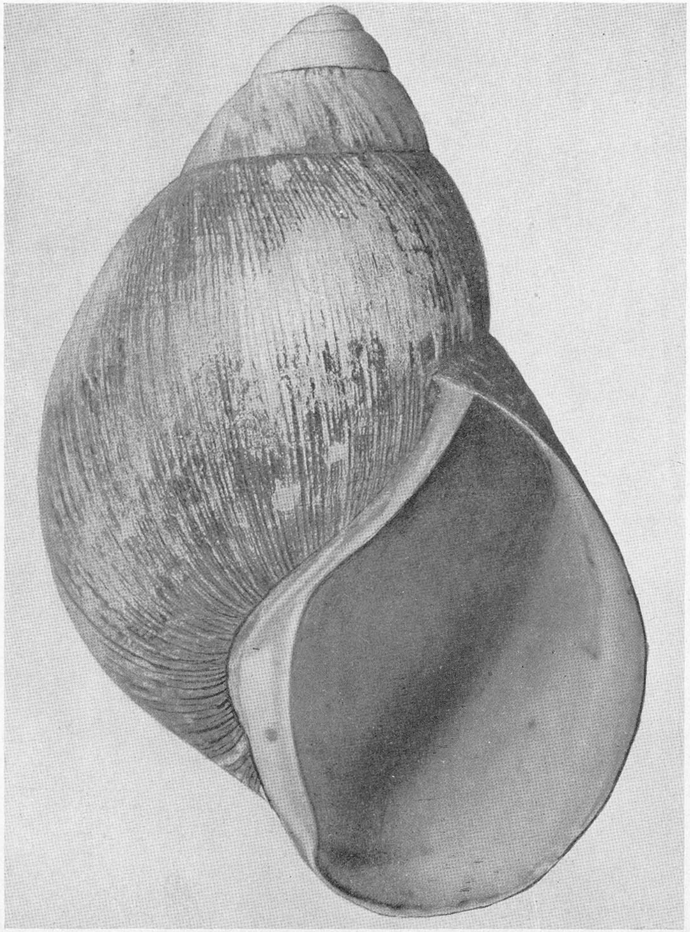


2

Fig. 1. Logo woman wearing a necklace made from shell disks of Achatinidæ and human teeth. Faradje.
Fig. 2. Strings of beads made of shell disks of Achatinidæ, worn around the hip. Logo, Faradje.
Photographs by H. Lang.



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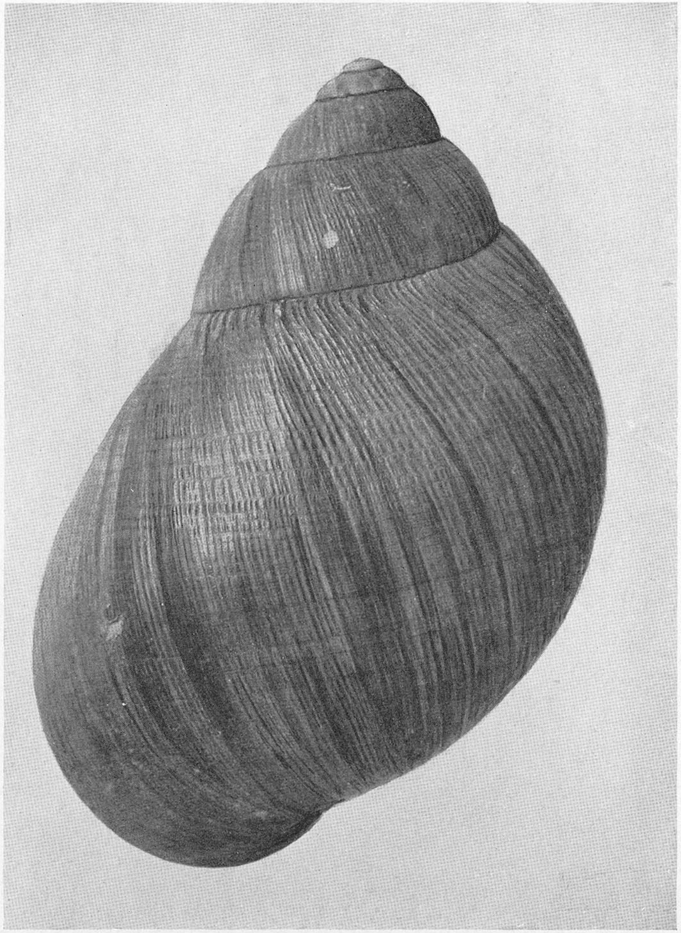

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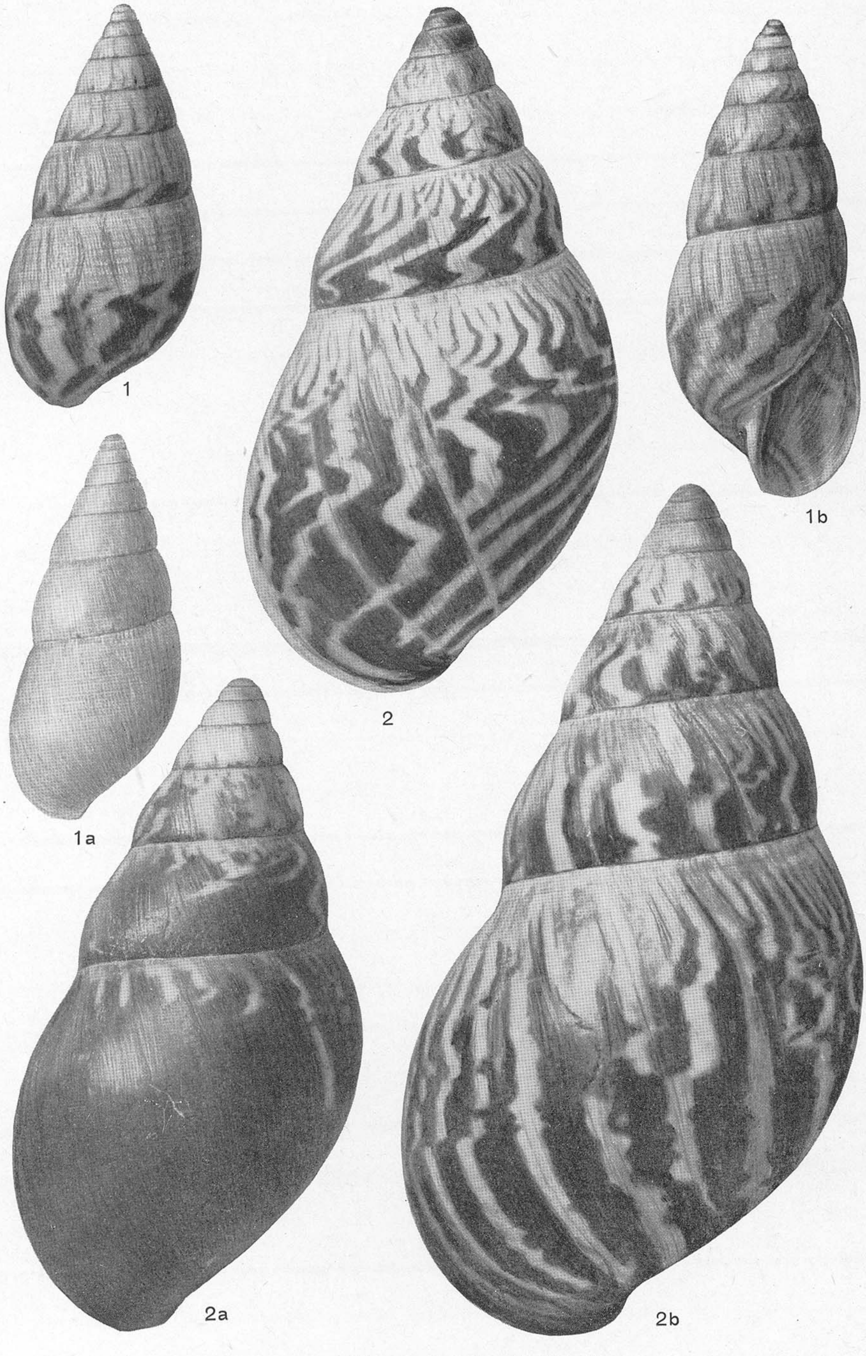
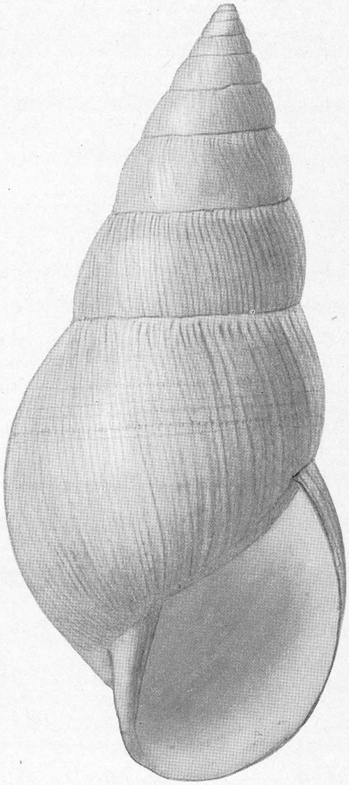
Figs. 1 and 2. *Burtoa nilotica obliqua* (v. Martens). Stanleyville.
Natural size.



Figs. 1 and 1*b*. *Limicolaria walkeri* Pilsbry. Mobeka; fig. 1*b* is the type.
Fig. 1*a*. *Limicolaria walkeri* mutation *nudata* Pilsbry. Mobeka.
Figs. 2, 2*a*, and 2*b*. *Achatina weynsi* Dautzenberg Nouvelle Anvers.
All natural size.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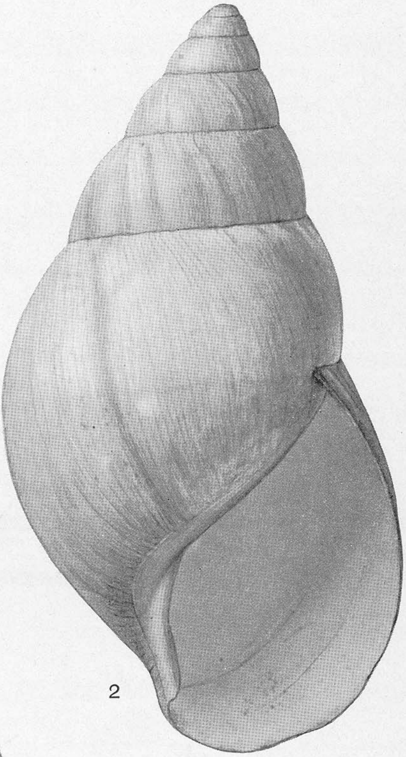
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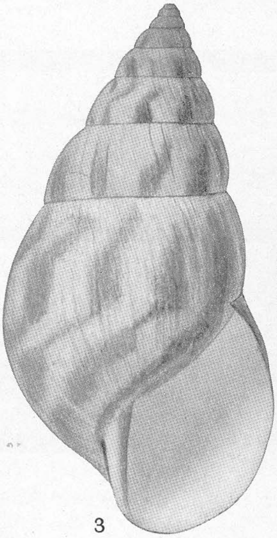
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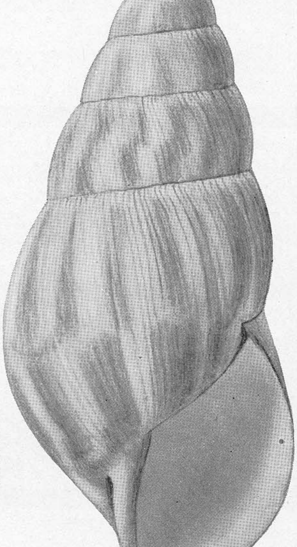
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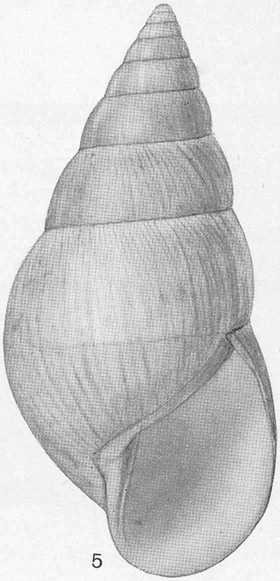
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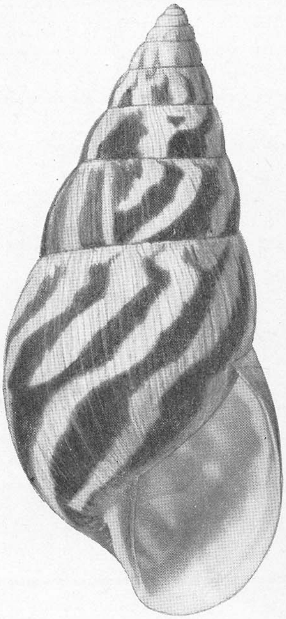
Fig. 1. *Limicolaria festiva* mutation *clara* Pilsbry; large form. Five hours north of Faradje
Fig. 2. *Achatina weynsi* mutation *rosaxis* Pilsbry. Nouvelle Anvers.
Figs. 3, 4, and 5. *Limicolaria festiva* mutation *clara* Pilsbry. Five hours north of Faradje. Fig. 5 represents the type of the mutation *clara*.

All natural size.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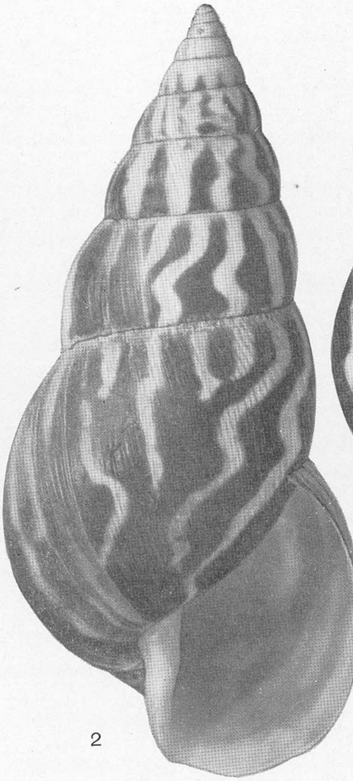
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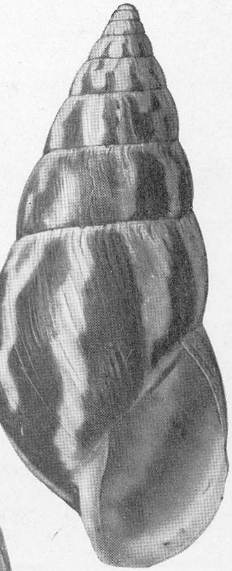
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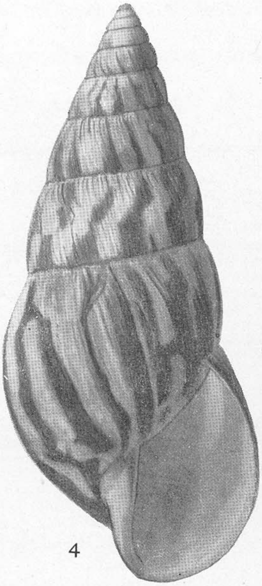
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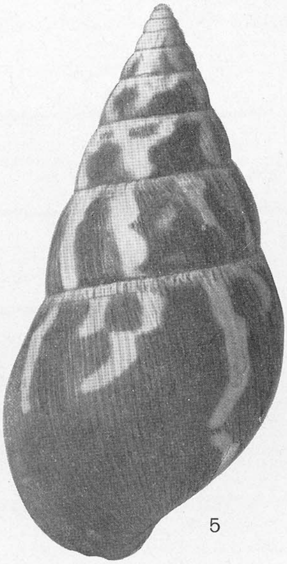
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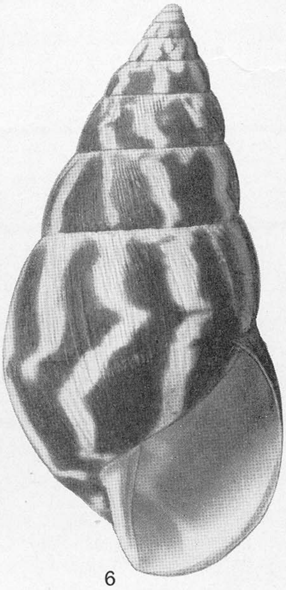
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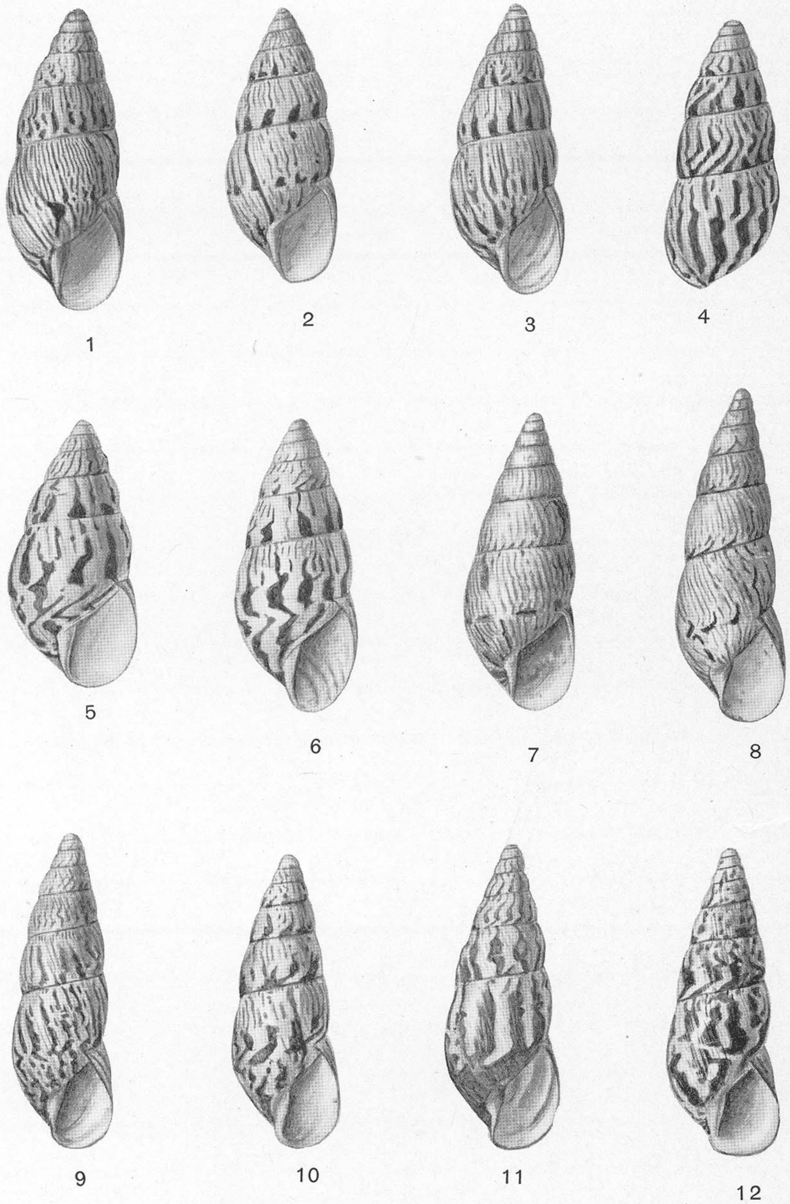
Figs. 1 to 3, 5, and 6. *Limicolaria festiva* (v. Martens). Five hours north of Faradje.
Fig. 4. *Limicolaria festiva* (v. Martens). Niangara.
All natural size.



Figs. 1 to 6. *Limicolaria distincta* Putzeys. Stanleyville.
Figs. 7 to 12. *Limicolaria læta medjensis* Pilsbry. Medje; fig. 8 is the type.
All natural size.

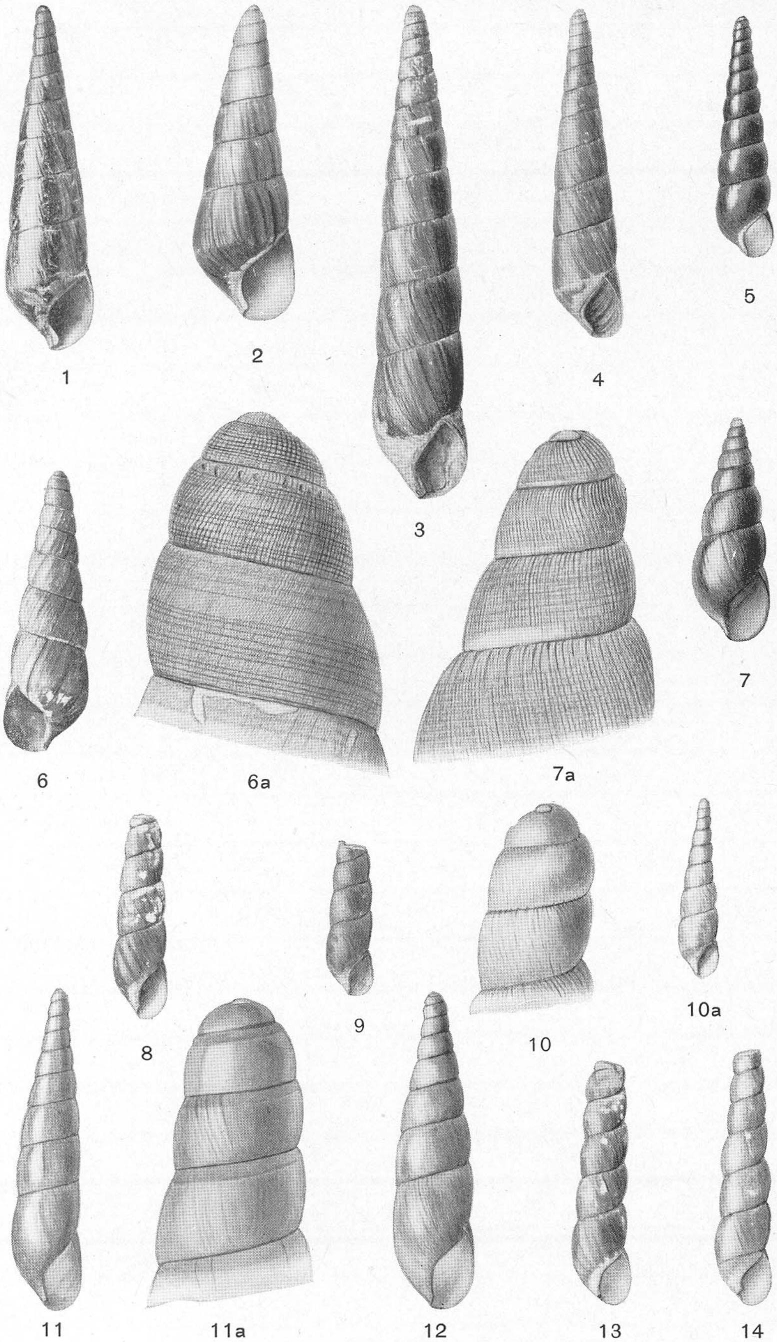
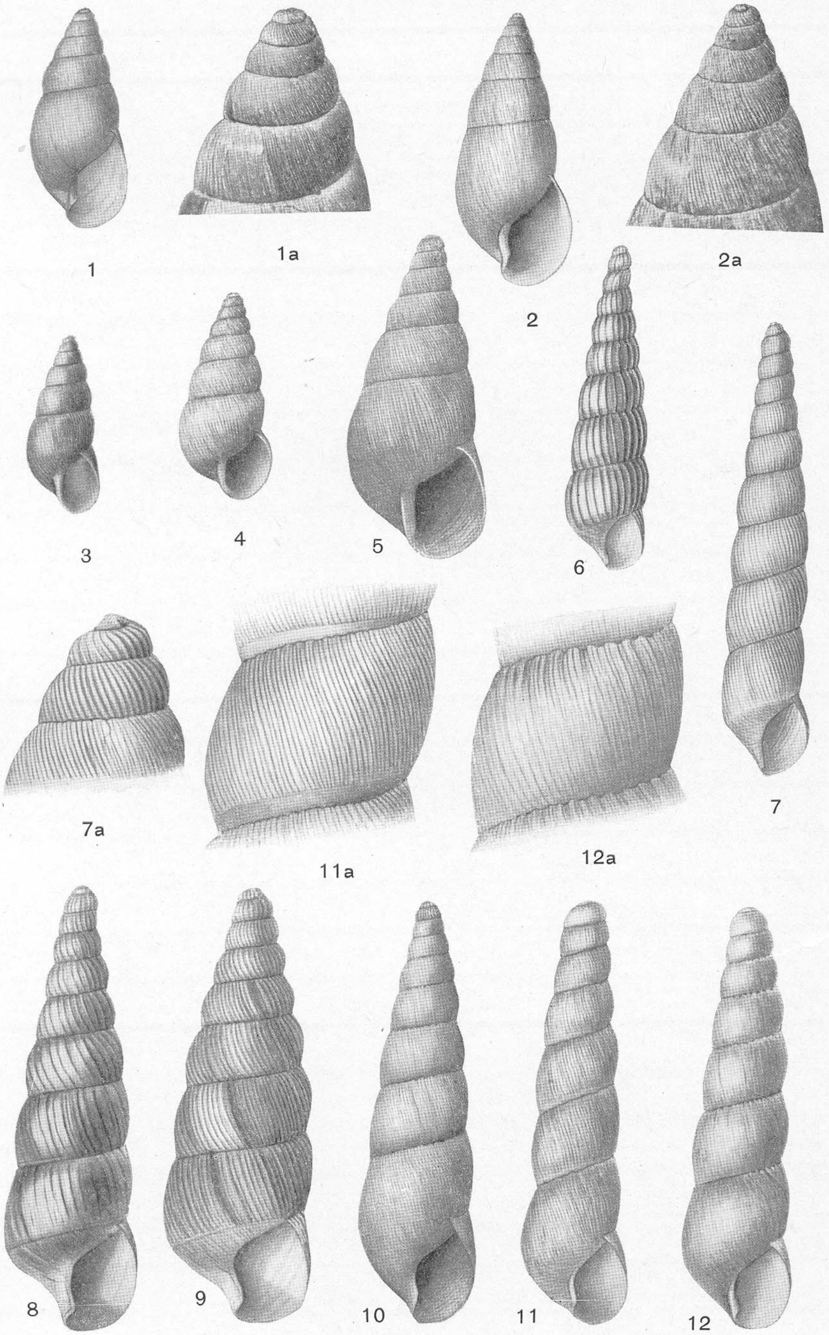
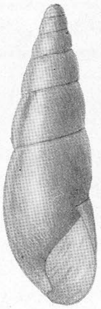


Fig. 1. *Homorus kwidschwiensis nigricans* Pilsbry. Masisi; type.
Fig. 2. *Homorus osborni* Pilsbry. Zambi; type.
Fig. 3. *Homorus alberti* Pilsbry. Medje; type.
Fig. 4. *Homorus langi* Pilsbry. Zambi; type.
Fig. 5. *Homorus ischnus* Pilsbry. Avakubi; type.
Figs. 6 and 6*a*. *Homorus bequaerti* Pilsbry. Fig. 6 is the type from the Butagu Valley; fig. 6*a* is from a Lanuri Valley shell.
Figs. 7 and 7*a*. *Homorus olivaceus* Pollonera. Butagu Valley.
Figs. 8 to 10*a*. *Homorus amputatus* Pilsbry. Medje; fig. 8 is the type.
Figs. 11 and 11*a*. *Homorus clarus* Pilsbry. Rutshuru.
Fig. 12. *Homorus clarus* Pilsbry; stout form. Rutshuru.
Figs. 13 and 14. *Homorus amputatus* Pilsbry; large form. Medje.



Figs. 1 and 1*a*. *Pseudoglessula walikalensis* Pilsbry. Walikale.
Figs. 2 and 2*a*. *Pseudoglessula intermedia masisiensis* Pilsbry. Mbisi.
Fig. 3. *Pseudoglessula leopoldvillensis* Pilsbry. Leopoldville; type.
Fig. 4. *Pseudoglessula hessei* (C. R. Bœttger). Zambi.
Fig. 5. *Pseudoglessula umbilicata* Pilsbry. Rutshuru; type.
Fig. 6. *Pseudoglessula famelica* Pilsbry. Penge; type.
Figs. 7 and 7*a*. *Pseudoglessula gracillima* Pilsbry. Medje.
Fig. 8. *Pseudoglessula subfuscidula* Pilsbry. Penge; type.
Fig. 9. *Pseudoglessula cruda* Pilsbry. Penge; type.
Fig. 10. *Subulina glyptocephala* Pilsbry. Thysville; type.
Figs. 11 and 11*a*. *Subulina avakubiensis* Pilsbry, and penult whorl more enlarged. Avakubi; type.
Figs. 12 and 12*a*. *Subulina thysvillensis* Pilsbry, and penult whorl more enlarged. Thysville; type.



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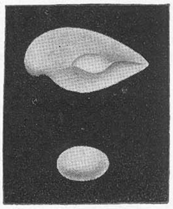

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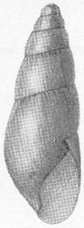

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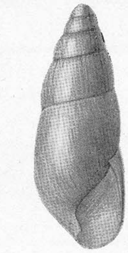

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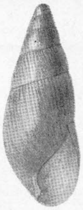

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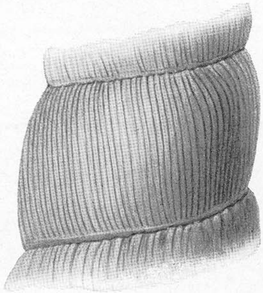

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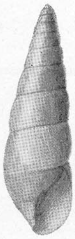

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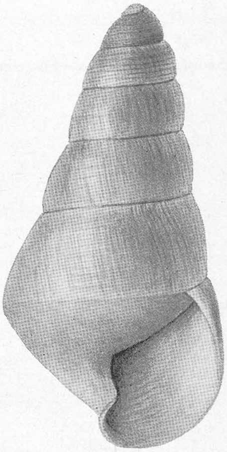

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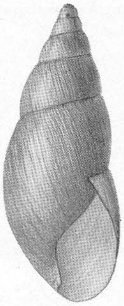

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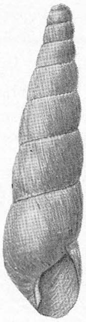

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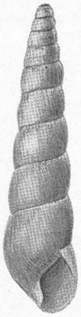

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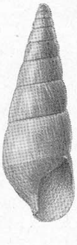

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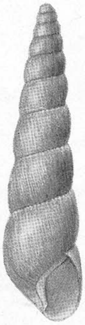

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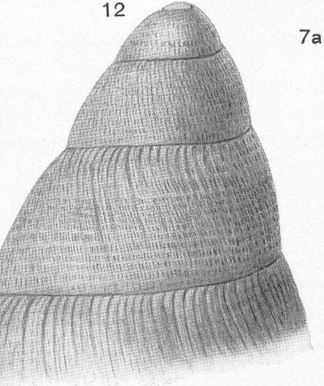

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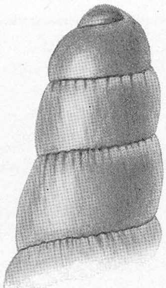

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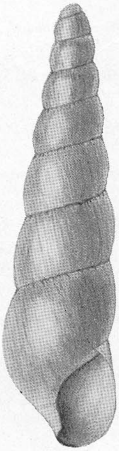

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Fig. 1. *Nothapalus paucispira xanthophaes* Pilsbry. Avakubi; type.
Fig. 2. *Nothapalus paucispira xanthophaes* Pilsbry, inside of epiphragm and egg.
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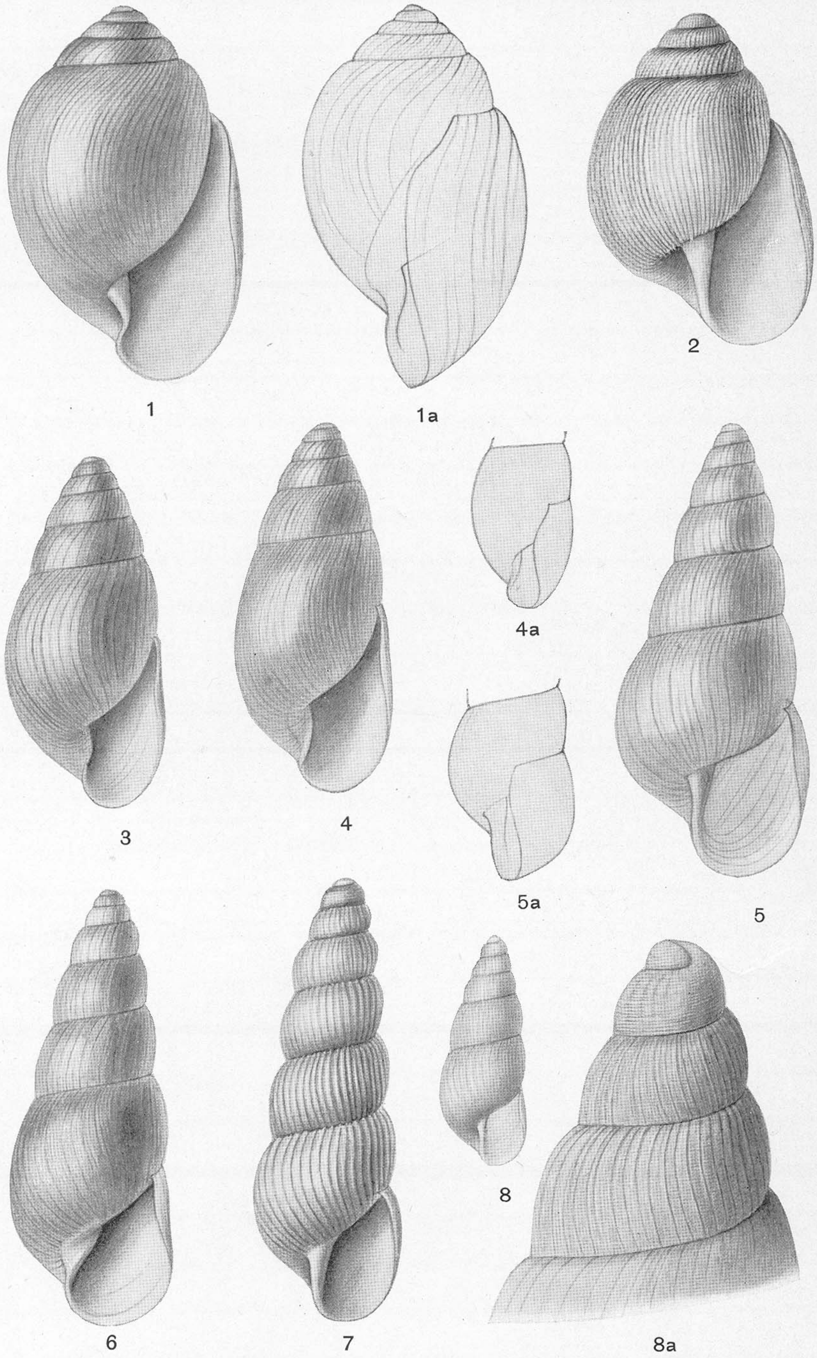

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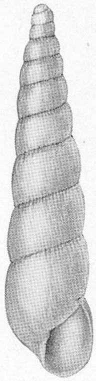
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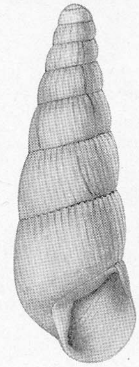
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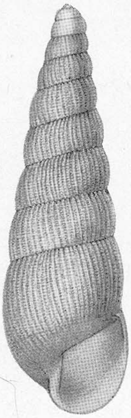
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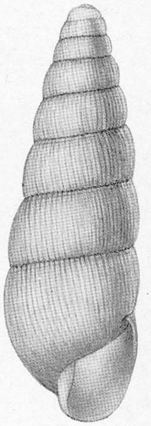
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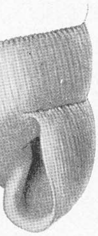
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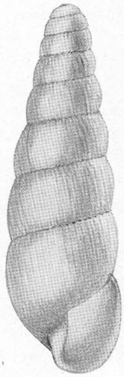
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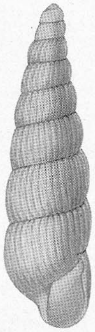
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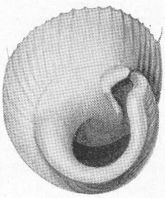
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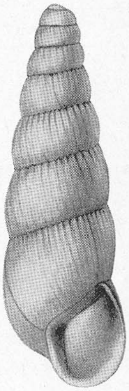
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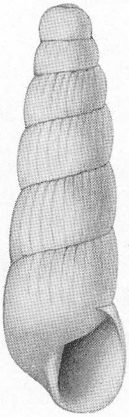
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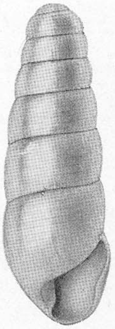
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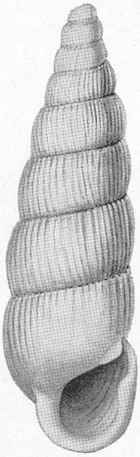
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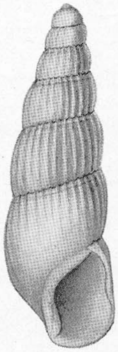
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Fig. 1. *Streptostele zambiensis* Pilsbry. Zambi; type.
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Fig. 8. *Streptostele centralis coloba* Pilsbry. Penge; type.
Fig. 9. *Streptostele bacillum* Pilsbry. Penge; type.
Fig. 10. *Streptostele teres* Pilsbry. Lanuri Valley; type.
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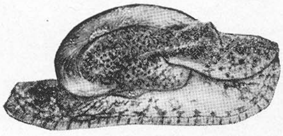
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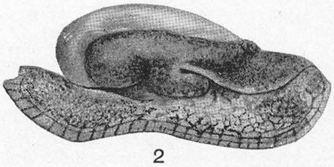
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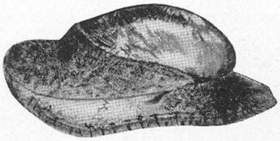
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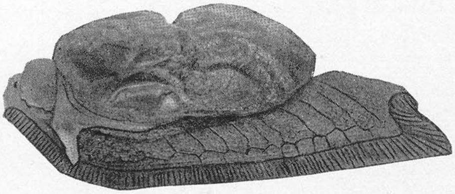
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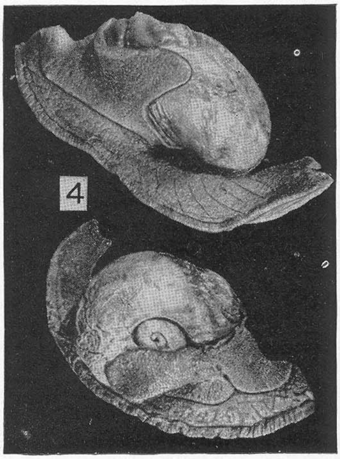
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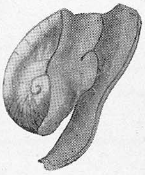
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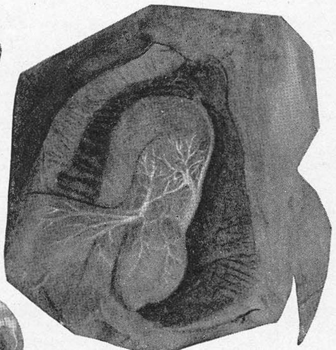
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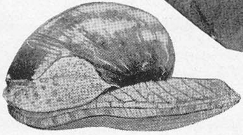
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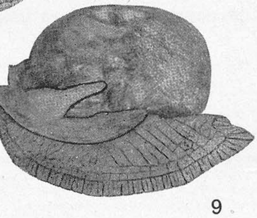
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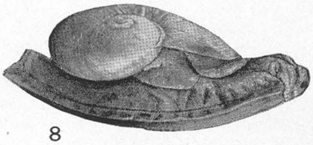
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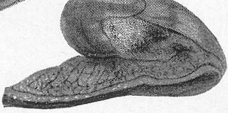
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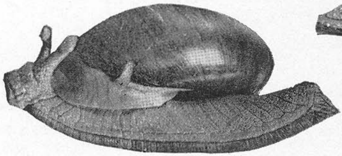
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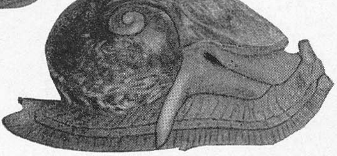
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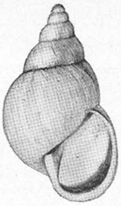
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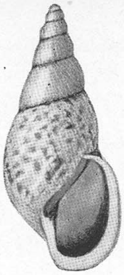
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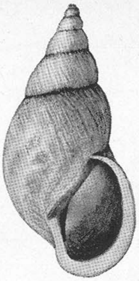
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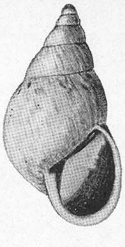
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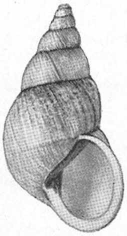
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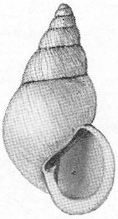
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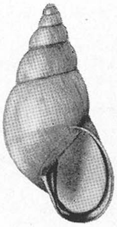
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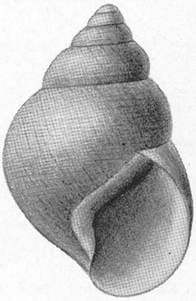
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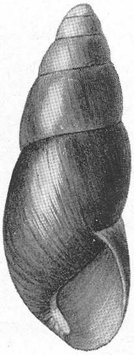
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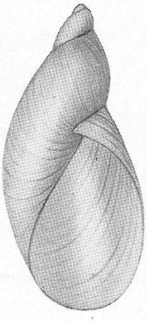
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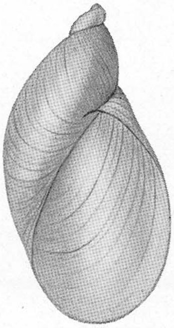
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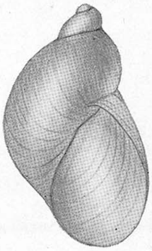
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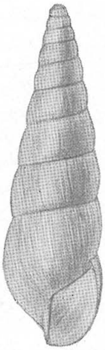
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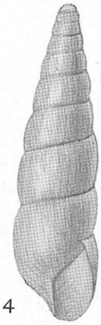
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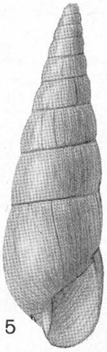
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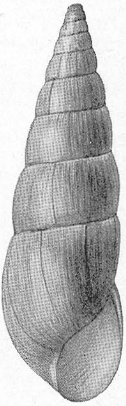
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